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Vol. XXVII April, 1951 No. 2

THE PAN-PACIFIC ENTOMOLOGIST

Published by the
Pacific Coast Entomological Society
in cooperation with
The California Academy of Sciences

CONTENTS

WIRTH—A new mountain midge from California 49
BEAL—Habitats of species of Novelsis 57
MacSWAIN—A new genus of Meloidae from North America 58
BREAKEY & PROPP—The spinose ear tick in Washington 59
MICHENER—Records and descriptions of Megachilid bees from Texas 61
ADAMS & MacNEILL—Gelastocoris rotundatus Champion in California 71
MacSWAIN—New North American species of Nemognatha and Zonitis 72
FRICK—Liriomyza langei, a new species of leaf miner of economic importance in California 81
BOOK NOTICE 89
STARK—A specimen of Hoplopsyllus anomalus (Baker) lacking a pronotal ctenidium (Siphonaptera) 91
WHEELER—Dettopsomyia and Ptilomyia: two genera new to the United States 92
HELFER—A new subspecies of Metataenia 94
ROTH—New records for Streblidae and Nycteribiidae 96

San Francisco, California
1951

THE PAN-PACIFIC ENTOMOLOGIST

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Send orders to: Treasurer, Pacific Coast Entomological Society, California Academy of Sciences, San Francisco.

Entered as second class matter, February 10, 1925, at the post office at San Francisco, under act of August 24, 1912.

The Pan-Pacific Entomologist

Vol. XXVII, No. 2 April, 1951

A NEW MOUNTAIN MIDGE FROM CALIFORNIA

(Diptera: Deuterophlebiidae)

Willis W. Wirth

Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, United States Department of Agriculture

The peculiar nematocerous Diptera known as "mountain midges" have excited the interest and curiosity of biologists whenever they have been found. This has by no means been a common occurrence, as evidenced by the fact that the first adults were not known until 1922, when Edwards described the male of *Deuterophlebia mirabilis* from Kashmir at an elevation of 11,000-12,000 feet in some of the highest mountains of the world. In 1924 Pulikovsky described the first known larvae, pupae, and females of an unnamed species from the Altai Mountains in Siberia. Muttkowski (1927) figured a larva from Yellowstone National Park, Wyoming, which probably belongs to a species, *D. coloradensis,* described by Pennak in 1945 from Colorado. Brodsky (1930) described the larva, pupa, and female of *D. mirabilis* from Central Asia. The Japanese species, *D. nipponica,* was first reported by Kitakami in 1929, by Kawamura in 1932, and Yie in 1933, but was not named and fully described until 1938, when Kitakami gave it what is still the most complete study for any known species, based on many specimens of all stages. The same author *(ibid.)* described the larva and pupa of a second species, *D. tyosenensis,* from northern Korea. Pennak *(ibid.)* has very ably summarized the existing knowledge of the family, including references to the collecting of larvae of undetermined species in Convict Creek, Mono Co., California, and Rock Creek, Benton Co., Oregon. Stone (1949) noted the collection of a male pupa of *D. coloradensis* from Peoria Slough, Oregon, but, as will be shown later, his record probably refers to the new species here described. Thus, up to the present time only four species of *Deuterophlebia* have been named, two of which are known from the immature stages only.

During the summer of 1948 the writer had the opportunity to search for deuterophlebiids over a wide area of northern and coastal

California. His hunt was finally rewarded in the mountains near Mount Shasta in the headwaters of the Sacramento River, when he collected large numbers of larvae and pupae in a small rapid mountain stream. After finding the immature stages several hours before dusk, he made a rapid search for adults in the vicinity, but without success, owing partly to lack of time, which also precluded further visits. However, the dissection of male and female imagoes from mature pupae makes possible the description of all stages of this species, and original observations on the biology, although limited, supplement existing knowledge.

NOTES ON THE HABITS OF THE LARVAE. The larvae were collected in Fawn Creek, near its junction with the South Fork of the Sacramento River at about 5,000 feet elevation, about 10 miles southwest of Mount Shasta City, California. The stream is a typical cold mountain creek, several feet wide with riffles several inches deep, cascading over boulders and stones at a 45° slope from the last pockets of melting snow on the slopes 2,000 feet above.

The deuterophlebiid larvae and pupae were found on the upper surface of smooth rocks, where they seemed to prefer the water line or the splash at riffle areas. They were also found on broad, fairly flat rocks covered with a thin film of very swift water. The larvae spent much time moving the head and anterior portion of the body in an arc from side to side, presumably feeding on particles they scraped off the surface of the rock. Locomotion was in a characteristic zig-zag lateral course, made possible by alternate loosening of anterior and posterior ends of the body, rotating the free end in an arc to the side, and re-attaching. A similar method for blephariceríd larvae has been described by Kellogg (1903). When the larvae are disturbed, locomotion may be surprisingly rapid, especially considering the amount of co-ordination necessary to move several sets of legs at one time, and the hazard of being swept away in the swift current.

The exceedingly simple mechanism of hooks and sucker of the larval prolegs was described and illustrated by Pulikovsky. In looking at her figures, however, the writer has reached a different conclusion regarding the function of this mechanism. It seems that the primary force for secure attachment or adhesion is not the suction of the pad at the end of the leg, but rather the simultaneous traction of the hundreds of minute retrorse hooks on each leg, which is greatest when the leg is relaxed and extended. The primary muscles

of the leg, which are attached at the center of the pad at the end of the leg, would then act by their contraction to invaginate the rows of hooks, the distal rows first, thus shortening the leg and releasing its hold on the substrate preparatory to movement.

Owing to the scarcity of males and male pupae, Kitakami postulates that *D. nipponica* may reproduce by parthenogenesis. The collection of about equal numbers of pupae of both sexes in the California material would indicate normal reproduction. The seasonal distribution of the present species is not known, but the collection of about equal numbers of larvae of all sizes indicates the existence of no marked broods, at least in mid-summer. There are four larval instars, according to Kitakami.

The deuterophlebiids were closely associated with several other dipterous larvae and pupae of similar body form and similar habit. Individuals of undetermined species of two genera of Blephariceridae, *Agathon* and *Philorus*, were numerous, usually in deeper water than the *Deuterophlebia*. The psychodid genus *Maruina* was represented in greater abundance, and usually in shallower water or closer to the water line or upper splash line.

The discovery of this colony of *Deuterophlebia* coincided with the adoption of, and can be almost wholly credited to, the use of an apparently crude but nevertheless amazingly effective collecting method, described by Fritz Müller in 1895 for collecting *Maruina* larvae. One need only to pass his fingers, palms down, slowly and with moderate pressure over the rocks where larvae may be suspected of breeding. They are dislodged from the rocks and cling tightly to the skin, where their presence can be readily observed at close range, their color contrasting much more greatly with the hand than with the rocks of their natural habitat. The larvae can then be removed rapidly from the hand by knife or forceps, perhaps in the relative safety and comfort of a nearby boulder rather than at the brink or in the spray of a dangerous stream. More important, hundreds of samples can be taken in the time in which only one would have been possible by conventional screens, seines, or even by direct visual examination of the rocks.

Deuterophlebia shasta Wirth, new species

MALE: Length, undetermined; wing, 3.6 mm. by 1.7 mm. *Head* (fig. 1*b*) hidden under projecting mesonotum, small, transverse and flat. Eyes small, subspherical, without pubescence, diameter about a fourth entire width of head, projecting at antero-lateral corners of head. Clypeus with small prominent setose mesal lobe. Ocelli and

mouthparts absent; mouth opening on ventral side of clypeal lobe. Ventral margin of head rather flattened. Antennae (fig. 1*d*) six-segmented, very long, proportions of segments 10:5:16:6:6:560; first two segments enlarged, the first with fine setae; second ring-like, bare; third to fifth each with a small distal tubercle on mesal side bearing five to six peg-like hyaline sensillae; distal segment evenly tapered to filiform tip, with minute capitate sensillae on mesal surface of about proximal half.

Thorax robust, apparently devoid of vestiture. Prothorax much reduced, mesonotum very convex in front, broad and dorsally flattened caudad; scutellum flat and about four times as broad as long; postscutellum very large, as broad as mesonotum; metanotum triangular, hidden under first two abdominal tergites. Pleural structure not determined. Halteres grayish hyaline, with minute pubescence, the stem slender, knob subspherical.

Wing hyaline, with fine microtrichiae; with shape and apparent venation as in figure 1*e*; only costa, subcosta, and R_1 apparently thickened; the fan-like arrangement of secondary venation due to folding of the wing in the pupal case, this first pleat-like lengthwise, the whole then alternately folded in four sections.

Legs long and slender, proportions of mid legs as in fig. 1*h*, fore and hind legs similar; coxae and trochanters setose ventrally, the trochanters apparently two-segmented; femora with a few dorsal setae; tibiae and tarsi with well-developed ventral pubescence of fine capitate hairs; tibial spurs absent; tarsal segments obliquely articulated; last segment (fig. 1*i*) with claws unequal, reduced to lanceolate pubescent lobes, the empodium a flattened disc, nearly circular, the diameter subequal to length of fifth segment, the surfaces densely set with long very fine capitate hairs.

Abdomen broad at base, tapered distad to eighth segment which is greatly reduced and only half as broad as the genitalia. Sixth and seventh segments with low lateral prominences each bearing five or six strong, scattered spines. *Genitalia* (fig. 1*j*) simple, ninth tergite bilobed, extending between the basistyles about half their length, deeply emarginate mesad, each lobe with a pair of short blunt spines; ninth sternite poorly differentiated. Basistyles tapering, mesal surface with fine setae; dististyles simple, about half as long as basistyles, slightly tapered distad, flexor surface slightly concave and set with scattered short spinose setae. Aedeagus tube-like, slightly tapered caudad, arising between bases of basistyles, the rounded tip reaching their apices; apparently with a slightly sclerotized inner protrusible penis tube.

FEMALE: In general similar to the male, with the following differences: *Head* (fig. 1*a*) smaller than in male, with antennae (fig. 1*c*) short, segments in proportion of 27:10:30:10:10:18; the four flagellar segments at apices with one, three, three, and three, peg-like hyaline sensillae respectively; distal segment also with two mesal and one distal, short setae. *Legs* (fig. 1*g*) with femora much

stouter than in male; femora and tibiae with a few minute setae on extensor surface; tarsal segments with one or two pairs of small ventral spines, the articulations very oblique, segments two to four appearing rhomboidal; segment five with claws (fig. 1*f*) strong, equal, and simple, with basal swelling, empodium lanceolate, with short setae. *Abdomen* tapering to tip, with minute pubescence; seventh segment with single lateral bristle; eighth with irregular lateral lobe with about six short strong bristles; tenth tergite bilobed. Eighth sternite with a large conical invaginated genital chamber extending forward from the gonopore in middle of hind margin; ninth sternite bilobed, tenth sternite a pair of blunt pubescent lobes with a blunt smooth tubercle on mesal side of apices.

PUPA: *Length* variable, about 2.0-2.5 mm. Broadly oval, dorsal surface (figs. 2*a*, *f*) convex, especially in head region, flattened behind, integument strongly sclerotized dark brown, with strong gran-

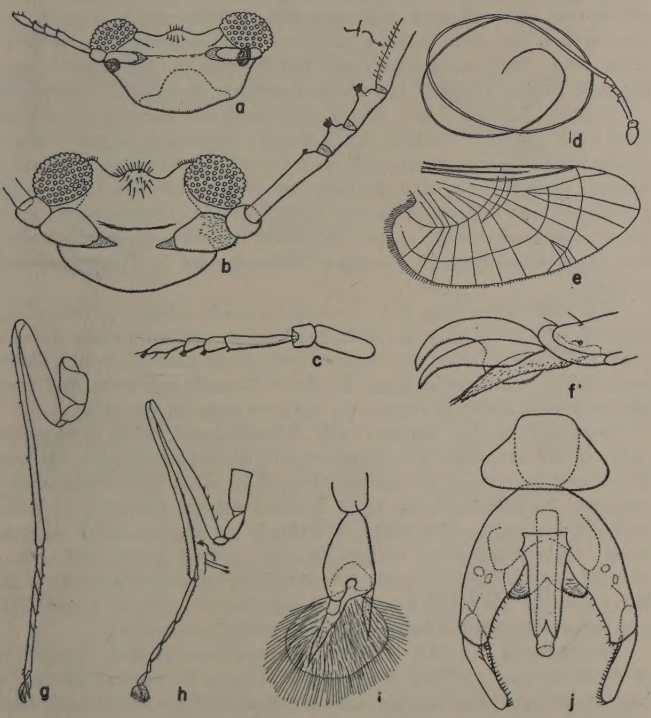

Figure 1. *Deuterophlebia shasta.* a. head, female; b. head, male; c. antenna, female; d. antenna, male; e. wing, male; f. fifth tarsal segment, female; g. mid-leg, female; h. mid-leg, male; i. fifth tarsal segment, male; j. genitalia, male, ventral aspect.

ulation especially on caudal margins of segments. Pro- and mesothorax fused, with median longitudinal seam (which splits at emergence of imago). A pair of prominent respiratory horns on anterolateral margin, each with a short thick stem and three very crooked filaments; a single long, stout spine arising from a conical tubercle dorsad of base of each respiratory organ; dorsal surface of body between these spines with a pair of long, transverse, sub-lateral lines of dark macro-granulation. Examination of the histoblasts in mature larvae shows that the respiratory organ is prothoracic, and the spine is mesothoracic. *Metanotum* small, not reaching lateral margins, with a pair of transverse lines of granulation similar to but shorter than those on mesonotum. First and second abdominal segments very narrow with ends curved forward, projecting free as very heavily sclerotized prominences with about a dozen strong black thorn-like spines. Segments three to five with undulating margins, sixth segment with five to six spines on caudo-lateral margin, mostly on ventral side; seventh segment with spinose caudo-lateral lobes bent around the small mesal eighth and ninth segments. Dorsally the male pupa distinguishable from the female by the much longer thoracic region (0.36 of the entire length in male; 0.27 in female).

Ventral surface (figs. 2*b*, *g*) flattened, not heavily sclerotized, with three pairs of blackish oval adhesive pads near lateral margins of abdominal segments three to five. Sexual dimorphism extreme on ventral aspect; male with the long antennal cases each forming two elliptical rings appressed around body; female attennal cases short, not reaching past wing cases; the latter reaching to fourth abdominal segment; leg cases reaching fifth segment in female, seventh in male.

Mature Larva (fig. 2*e*): Length variable, about 3.5 mm. Color yellowish-white, with some scattered orange pigment along dorsum, head and base of antennae dark brown. Body plano-convex; eleven-segmented, counting the head, the three thoracic segments, and seven leg-bearing abdominal segments; without trace of spiracles.

Head rather flat, clypeus well differentiated, with four lateral pairs of minute setae, two lateral pairs of setae well back on frons and about four pairs of multiple-branched setae near base of each antenna. Antenna arising from a short conical tubercle, proximal segment brownish sclerotized, two-thirds as long as width of head, stout, slightly tapering; bifurcating into a long dorsal and a short ventral, membranous branches, respectively about twice as long and three-fourths as long as proximal segment. A pair of small black eye-spots near lateral margin of head behind antennae.

Mouthparts (fig. 2*h*): Labrum membranous, bilobate, projecting in front of, and curving down below clypeus to ventral surface of head, with a pair of densely setose ridges curving from lateral corners in front to near mid-line on caudo-ventral margin of labrum; sides of labrum with series of short, plate-like setae. Mandibles with a heavily sclerotized ring, bearing a narrow transverse comb of brown setae, and a dense tuft of long brown hairs on caudo-mesal

margin. Maxillae a transverse lobe with a comb-like row of dense short setae, a small palpus on caudal margin near lateral ends and a small black granular spot on caudal margin near mid-line. Labium apparently a submedian pair of sclerotized flaps.

Thorax with three well-marked segments, the mesothorax broadest and most highly pigmented.

Abdomen broadest at segment four, each of the seven preapical segments with a well developed lateral pseudopod or proleg, each bearing a distal series of eight to eleven rows of small dense black hooks (fig. 2*c*). Front and hind margins of prolegs with dense vestiture of long, multiple-branched black hairs. Each segment dorsally with a few fine setae in a transverse row. Eighth segment consisting of a pair of tapering curved lobes, bearing a pair of black peg-like spines and a hair at apex (fig. 2*d*); on ventral side with five white, sausage-shaped, anal gills.

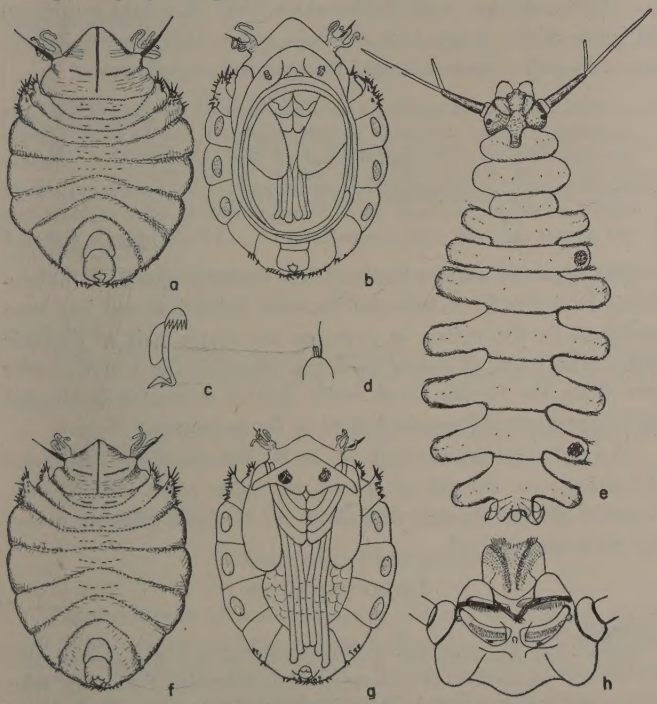

Figure 2. *Deuterophlebia shasta*. a. male pupa, dorsal view; b. same, ventral; c. detail of hook of larval proleg; d. detail of tip of eighth abdominal segment of larva; e. mature larva, dorsal view (hooks of second and sixth prolegs, right side, inverted); f. female pupa, dorsal view; g. same, ventral; h. larval head, ventral view showing mouth parts.

Holotype male, dissected from pupa, FAWN CREEK, near headwaters of South Fork, Sacramento River, SISKIYOU COUNTY, CALIFORNIA, July 22, 1948, W. W. Wirth. (TYPE No. 59,374, U. S. National Museum) *allotype* female; *paratypes* 2 males, 1 female dissected from pupae; 25 pupae and 100 larvae in various stages, same data as type. Adult paratypes will be deposited in the California Academy of Sciences and the British Museum of Natural History.

COMPARATIVE NOTES. The species of *Deuterophlebia* are difficult to separate in the larval and adult stages because of poorly diagnostic characters. However, the pupae are quite distinctive and Pennak has given a key to separate them. *D. shasta* falls in couplet two of Pennak's key with Pulikovsky's Altai Mountain species on the basis of the single long thoracic spine near the respiratory organ. From her species it may be separated as follows:

Pupa with distinct transverse granulose lines on dorsum of thoracic segments; larvae yellowish to light orange in color; adult female antenna with two pre-apical setae on last segment.....*shasta*

Pupa without differentiated lines on dorsum of thorax; larvae dark brown on dorsal surface; adult female antenna with at least five pre-apical setae on last segment..... (Pulikovsky's species)

The pupa reported by Stone (1949) from Oregon as *D. coloradensis* is in the U. S. National Museum collection and has been examined by the writer. It possesses the single pair of thoracic spines. The range of *shasta* doubtless extends over a much wider area along the Pacific Coast while that of *coloradensis* remains within the Rocky Mountain system so far as known.

The writer wishes to thank Dr. R. W. Pennak of the University of Colorado for the gift of larvae and pupae of *D. coloradensis*. Pupae of the two Japanese species in the National Museum collection were also studied.

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HABITATS OF SPECIES OF NOVELSIS

(Coleoptera: Dermestidae)

Mature larvae of *Novelsis horni* (Jayne) were taken on Dec. 27, 1950, one by the writer from a *Sceliphron* nest 5 miles north of Tucson, Arizona, and one by C. B. Beal from a Leptochiline-like nest in the sandy bank of the Santa Cruz River 9 miles south of Tucson. A single mature larva of *Novelsis varicolor* (Jayne) was found by the writer in a *Sceliphron* nest 11 miles northeast of Tucson on December 28. All the larvae were reared to adults on pollen in a temperature cabinet at 31° C.—R. S. Beal, Jr.

A NEW GENUS OF MELOIDAE FROM NORTH AMERICA

J. W. MacSwain
University of California, Berkeley

In North America the genus *Lytta* has long been recognized as being made up of several well defined species groups. Horn (1873)[1] in his synopsis of the genus first suggested such a division and he was followed by Fall (1901)[2] and others as additional species were described. However, larval studies coupled with field observations and a re-evaluation of the significance of adult structures clearly indicate that the genus as now recognized is polyphyletic. The species which have previously been assigned to Group 3 of Horn's classification can now be shown to be an annectant group whose features relate them more closely to *Epicauta* than to *Lytta*.

Genus Linsleya[3] new genus

Antennae with segments compressed, intermediate segments either sub-quadrate or transverse. Legs with front tibia sericeous on its inner face; hind tibial spurs equal, slender and acute.

Type: *Lytta convexa* LeConte.

In addition to the type, the following species are assigned to this genus on the basis of the adult characters; *L. sphaericollis* Say, *L. compressicornis* (Horn), *L. infidelis* (Fall) and *L. suavissima* Wellman.

The genus as here defined should be placed as a primitive group of the Epicautini. Such an assignment requires a modification of the present definition of this tribe, as based on the adults, to include members lacking a sericeous patch on the anterior femora but possessing such a patch on the anterior tibia. No modification of the tribal definition is necessary for the inclusion of the larvae, although only the first instar larva of *L. convexa* is known at the present. Finally it may be stated that the activity pattern of the adults of several species has been observed by the author to be more typically Epicautine than Lyttine.

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[1]Horn, G. H. 1873. Revision of the species of several genera of Meloidae of the United States. Proc. Am. Phil. Soc. 13:88-117.

[2]Fall, H. C. 1901. Notes on *Dichelonycha* and *Cantharis*, with descriptions of new species in other genera. Tran. Am. Ent. Soc. 27:277-316.

[3]Named in honor of E. G. Linsley in partial recognition of his many contributions toward a knowledge of the biology and systematics of the Coleoptera.

THE SPINOSE EAR TICK IN WASHINGTON[1]

E. P. BREAKEY[2] AND HAROLD PROPP[3]

Ticks collected from the ears of cattle on the A. D. Olson Ranch near Beverly, in central Washington, in November, 1949, were referred to the senior author's attention on February 8, 1950. They were tentatively identified as the spinose ear tick, *Otobius megnini* (Dugès). Immediately, specimens were sent to Dr. F. C. Bishopp, Assistant Chief, Bureau of Entomology and Plant Quarantine, who verified our determination.

Dr. Bishopp stated (*in litt.*), "It is unusual to have a general infestation of this tick as far north as Beverly, Washington, although it has been taken on several occasions in the state of Washington."

Dr. Bishopp also asked if any of the cattle on the ranch had been brought in from the south, since the species is native to the southwestern United States.

In the meantime, Dr. M. O. Barnes, Supervisor, Division of Dairy and Livestock, Washington State Department of Agriculture, Olympia, had been questioned regarding the presence of the spinose ear tick in Washington. Dr. Barnes stated (*in. litt.*), "Several years ago, I had an opportunity to investigate severe tick infestation in the ears of cattle in eastern Washington; however, it was doubted at that time if the tick could be identified as the spinose ear tick."

When A. D. Olson, owner of the cattle, was questioned regarding the history of the infestation, he stated (*in litt.*), "We have been running livestock in this locality for 20 years. We have been running cattle for the last five years and sheep fifteen years prior to that. We have not shipped in any stock from any southern states. We have always had ticks here but the ear tick has been bothering us only about two years. The ear tick infestation was heavier this year than in previous years. We did not examine the sheeps' ears as they did not give us trouble, but we have always found them in the dogs' ears."

David H. Brannon, Extension Entomologist, State College of Washington, believes that the spinose ear tick has been present in central Washington for a number of years. Recently, he displayed

[1]Scientific Paper No. 973, Washington Agricultural Experiment Stations, Institute of Agricultural Sciences, State College of Washington, Pullman.

[2]Associate Entomologist, Western Washington Experiment Station, Puyallup.
[3]Veterinarian, Bureau of Animal Industry, U. S. Department of Agriculture.

some specimens of this tick which he had mounted in plastic for the purpose of acquainting county agents and ranchers in the area with the appearance of the pest. A few days later, Brannon wrote as follows: "In going over our insect identification record in the office, I find that Laurel Smith (Brannon's predecessor) reported the spinose ear tick on September 3, 1942. The identification was made by Dr. Roy D. Shenefelt. The ticks were collected from cattle near Quincy. They were sent to Laurel Smith by D. Sinclair through L. R. Nicholson from Ellensburg. Smith states that four cattle had died from the effects. Smith also notes, "This is the first record I know of from this state. It has been recorded from Alberta. Insect Pest Survey has been notified and any records of previous infestations from the state requested." This is the only record we have in our files on the spinose ear tick other than the specimens I showed you when I was in Puyallup."

The specimens sent to Dr. Bishopp for identification were slightly engorged nymphs. It appears that we are dealing with an infestation that is of several years standing. Apparently the ticks pass the winter in central Washington as nymphs in the ears of the host, multiplication and dispersal taking place during the summer. It is not surprising that a southern species with such habits should be able to survive in more northern localities, since temperature changes on the host during the winter would not be great.

Bishopp and Trembley (1945) state "It is unlikely that *Ornithodoros megnini* will ever become permanently established or assume such importance as a livestock pest in states to the east of Texas or to the north of Oklahoma, New Mexico, Arizona, and California, with the possible exception of certain parts of southern Colorado, Utah and Nevada." Certain exceptions to this generalization are then given.

This tick was also collected by J. D. Gregson in December, 1943, in the ears of mountain goat at Bryant Creek, British Columbia. Since a nymph was taken from the ear of a cat in the same vicinity (Ewings Landing on Okanagan Lake, B. C.) on October 6, 1941, it also appears that the pest may be established there, at least temporarily.

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RECORDS AND DESCRIPTIONS OF MEGACHILID BEES FROM TEXAS
(Hymenoptera)

Charles D. Michener
University of Kansas, Lawrence

In previous papers[1] the thesis was developed that several groups of megachilid bees are confined to the westernmost deserts of North America, immediately east of the great mountain divides of central and southern California. This idea was based on extensive collecting in California and some collecting in Arizona by the author, Timberlake and others, and extensive collecting in New Mexico and Colorado by Cockerell. Of particular importance were Cockerell's collections from southern New Mexico, made in desert areas similar in many ways to the Californian deserts. His material lacked the groups involved.

In the spring of 1949 the author, in company with his wife and Doctor and Mrs. R. H. Beamer, spent a week collecting in western Texas and obtained in these easternmost North American deserts members of several groups once thought to be confined to the western desert or at least concentrated there. Such groups are *Anthocopa* of the subgenera *Phaeosmia* and *Eremosmia*. There remain several of the groups (e. g. *Proteriades* and two subgenera of *Ashmeadiella*) which are probably actually confined to the far west, but further collecting will be necessary to establish this. It becomes obvious that Cockerell's collecting in southern New Mexico was not sufficiently extensive to be used as a basis for zoogeographic generalizations, at least in connection with bees which fly in the spring.

Except as otherwise stated types of new forms are deposited in the Snow Entomological Collections, University of Kansas.

Anthocopa (Phaeosmia) rubrella Michener, 1949

It is now certain that the flowers on which the type series of this species were taken at Dryden, Texas, were a species of *Dalea*.

Additional records, all from Texas, are as follows: Marathon, April 13, 1949, on *Dalea argyraea;* Cooper's Store, Big Bend Na-

[1] Michener, C. D., 1939, A revision of the genus Ashmeadiella (Hymen., Megachilidae), Amer. Midland Nat., 22:1-84; 1943, The American bees of the genus Anthocopa with notes on Old World subgenera (Hymenoptera, Megachilidae), Ann. Ent. Soc. Amer., 36:49-86; 1944, The distribution of the oemiine bees of the deserts of North America, Amer. Nat., 78:257-266.

tional Park, April 11, 1949, on *Dalea neomexicana;* Sanderson, April 13, 1949, on *Dalea formosa* (all collected by R. H. Beamer and C. D. Michener).

The Sanderson series of two males and two females is interesting in that one specimen of each sex is entirely without red on the abdomen, and in the remaining female the red is very dark, particularly on the third metasomal tergum. The remaining male is fully as red as specimens from other localities. The absence of red in part of this series is possibly an intergradation toward *A. maryae,* but the clypeal margin is typical of *rubrella.*

ANTHOCOPA (PHAEOSMIA) MARYAE Michener, 1949

Three females, Quemada, Texas, on *Dalea pogonathera,* April 14, 1949, (R. H. Beamer, C. D. Michener.)

Anthocopa (Phaeosmia) daleae Michener, new species

This species, which raises the total number of known species of *Phaeosmia* to ten, resembles *rubrella* and *maryae* in the broad apical flange of the sixth metasomal tergum of the female, but differs from them as well as from all other species of *Phaeosmia* by having a strong longitudinal median carina on the clypeus and by having the apical margin of the clypeus feebly trilobed (fig. 7), the lobes being the angles which demark the truncation and a median convexity between them. The male differs from that of *rubrella* in the large second metasomal sternum, which reaches the seventh tergum when the abdomen is in repose. In the key to the males of *Phaeosmia* (Michener, 1949, Jour. Kansas Ent. Soc., 22:54) *daleae* runs to *enceliae* if the rounded rather than emarginate second sternum is ignored.

Female: Length 6 mm. (varying to 5.8 among paratypes). Black, pubescence dull white, ochraceous to light fuscous on lower half of clypeus and dorsum of head and thorax; tufts of hair beneath clypeal margin orange but very small, not exceeding clypeal margin; face rather densely pubescent to above level of antennae; mesepisterna and marginal portions of scutum and scutellum rather densely pubescent. Inner margins of eyes converging below. Punctation of head and thorax rather uniform and coarse, that of area immediately in front of anterior ocellus finer and dense, that of lower two thirds of clypeus also fine and dense except for the longitudinal median raised carina which marks this part of clypeus; lower end of carina low and narrow, upper end merging into rather coarsely punctate upper third of clypeus; clypeal truncation with impunctate but not thickened margin which is brownish; truncation longer than distance from its end to lateral angle of clypeus; median portion of

truncation slightly convex; distance between posterior ocelli slightly greater than distance from one of them to eye margin or to posterior edge of vertex; median ocellus about 1.5 times as far from antennal bases as from posterior edge of vertex; genal areas narrower than eye seen from side. Mandibles feebly dark red subapically, less than three times as long as greatest breadth, over three times as long as narrowest medial breadth, distance between first and second teeth less than that between second and third, margin between first and second teeth a V-shaped notch, that between second and third arcuate, subapical inner swelling absent; maxillary palpi longer than greatest width of galea, five-segmented, second segment longest, first and third subequal, slightly shorter, fourth slightly shorter than third, fifth very small and slender; first segment of labial palpus about 0.7 times as long as second. Thoracic punctation similar to that of vertex; tegulae smooth, transluscent dark testaceous. Legs black, tibial spurs pale brown. Wings slightly dusky, veins and stigma black. Abdomen black, posterior margins of terga feebly brownish; metasomal terga one to four with conspicuous apical bands of white pubescence, somewhat narrowed medially on first and second terga; sixth tergum somewhat pruinose, more finely and closely punctured than dorsal portions of first four terga; sixth tergum with apical flange, projecting at an angle to disc of tergum; scopa short, dull white, that of apical half of sixth metasomal sternum consisting of hairs which are bent subapically.

Male: Length 5.5 mm. (varying to 5.2 mm. among paratypes). Similar in appearance and punctation to female but punctures of entire clypeus and supraclypeal area fine and dense, those in front of anterior ocellus not so; face more densely covered with white pubescence; clypeus without longitudinal carina, margin transverse, coarsely denticulate, median portion with three large denticles, adjacent parts of margin with two denticles on each side. Mandibles bidentate, outer tooth the longest. Abdominal punctation and pubescense similar to that of female; sixth metasomal tergum with a narrow projecting flange produced to a median slightly obtuse angle and to a small rounded lobe at each side; seventh tergum small, brown, margin rounded laterally, straight medially; first sternum thickened, posterior margin straight; second sternum large, covering succeeding sterna, posterior margin broadly rounded, reddish brown; third sternum with a broad squarely cut emargination with a fringe of long hairs only medially; fourth to sixth sterna entire, broadly rounded, margin of fifth more clearly straight than others; seventh sternum with apical emargination; eighth with apex obtuse.

Holotype female, *allotype* male, and three female and two male *paratypes:* Cooper's Store, Big Bend National Park, Texas, on *Dalea neomexicana*, April 11, 1949 (R. H. Beamer, C. D. Michener). One female is from *Phacelia popei* but was not collecting pollen. One female *paratype:* Sanderson, Texas, on *Dalea formosa*, April 13, 1949 (R. H. Beamer, C. D. Michener).

This is the third Texan species of *Phaeosmia.* All are smaller than the more western species of this subgenus, but *daleae* in particular is closely related to the western group of species.

Anthocopa (Eremosmia) beameri Michener, new species

This is a species of typical *Eremosmia,* a group of bees hitherto known only from the California deserts. It has the appearance of a small specimen of *A. robustula* (Cockerell), from which it differs strikingly in the more nearly equidistant mandibular teeth of the male, in the coarsely punctured clypeus of the female with the upper portion shining, convex, with widely separated punctures, and in the rounded subapical inner mandibular swelling of the female. Because of the swollen upper part of the clypeus, the female might run to *laevibullata* in the key (Michener, 1943, Ann. Ent. Soc. Amer., 36:67). It differs from that species by the equidistant mandibular teeth of the female, among many other characters.

Female: Length 6.5 mm. (varying to 7.0 mm. among paratypes). Black, pubescence dull white, ochraceous on dorsum of head and thorax, tufts of hair beneath clypeal margin large, orange; sides of face and supra-antennal area rather densely pubescent to level of median ocellus, sides and dorsum of thorax also rather densely pubescent. Inner margins of eyes parallel. Punctation of head and thorax fine and dense, the vertex and supra-antennal areas particularly so; supraclypeal area more coarsely and sparsely punctate, especially below; clypeus with upper two thirds strongly bulging, coarsely punctured, with punctures widely separated especially medially where there is a longitudinal zone which is impunctate or nearly so; lower third of clypeus closely and rather finely punctate except for the impunctate, thin margin of the truncation; margin of truncation slightly shorter than distance from end of truncation to lateral angle of clypeus, angles demarking truncation rounded; distance between posterior ocelli subequal to distance from one of them to posterior margin of vertex and to eye margin; anterior ocellus with its anterior margin slightly nearer to antennal bases than to posterior edge of vertex; genal areas narrower than eyes seen from side. Mandibles dark red subapically, less than 2.5 times as long as greatest breadth, less than four times as long as shortest (medial) breadth, teeth large, their apices equidistant, inner subapical swelling rounded; maxillary palpi about as long as greatest width of galea, four-segmented, second segment longest, third and fourth slightly shorter; first segment of labial palpus about 0.6 times as long as second. Punctation of mesoscutum coarser than that of vertex, that of mesepisternum still more so; tegulae smooth, transparent testaceous. Legs black, tibial spurs brown. Wings slightly dusky, veins and stigma black. Abdomen black, posterior margins

of terga brownish, metasomal terga one to four with broad apical bands of white pubescence; sixth tergum and posterior portion of fifth pruinose; punctation fine, dense on fifth and sixth terga but sparser on others; scopa short, dull white.

Male: Length 6.5 mm. (6.0 to 6.8 mm. among paratypes). Similar in appearance and punctation to female but punctation of clypeus very fine and dense, face more densely covered with white pubescence; clypeal margin but little produced, edentate, slightly thickened and shining; inner orbits strongly diverging below. Mandibles tridentate, inner tooth much shorter than the others. Sixth metasomal tergum with posterior margin convex, with weak lateral lobes; seventh largely hidden, brown, margin with median notch. First sternum with posterior margin straight, second large, margin broadly rounded except for shallow, broad, median apical emargination, reaching to cover all but the apex of the fourth sternum; third sternum hidden, with broad, deep emargination which bears a fringe of long hairs medially; fourth sternum broadly rounded posteriorly, covering following sterna; sixth with small median notch in posterior margin; seventh with posterior margin broadly emarginate.

Holotype female, *allotype* male, and twenty-one male *paratypes:* Cooper's Store, Big Bend National Park, Texas, on *Phacelia popei*, April 11, 1949 (R. H. Beamer, C. D. Michener); four female *paratypes*, twenty miles south of Marathon, Texas, on *Nama hispidum*, April 12, 1949 (R .H. Beamer, C. D. Michener).

This species is named for Doctor R. H. Beamer who helped collect the type series, in addition to many other interesting bees from Texas, Kansas, and elsewhere.

Ashmeadiella (Ashmeadiella) bucconis denticulata Cresson, 1878

Cooper's Store, Big Bend National Park, Texas, April 11, 1949, (R. H. Beamer, C. D. Michener).

Ashmeadiella (Ashmeadiella) prosopidis (Cockerell), 1897

Hot Springs, Big Bend National Park, Texas, on *Prosopis juliflora*, April 11, 1949 (C. D. Michener, R. H. Beamer).

Ashmeadiella (Ashmeadiella) meliloti meliloti (Cockerell), 1897

Sanderson, Texas, on *Dalea formosa*, April 13, 1949 (R. H. Beamer and C. D. Michener); Quemada, Texas, on *Dalea pogonathera*, April 14, 1949 (R. H. Beamer and C. D. Michener).

ASHMEALIELLA (ASHMEADIELLA) CACTORUM CACTORUM (Cockerell), 1897

Twenty-five miles southeast of Dryden, Texas, on *Dalea argyraea*, April 13, 1949 (R. H. Beamer and C. D. Michener); Quemada, Texas, on *Dalea pogonathera*, April 14, 1949 (R. H. Beamer and C. D. Michener).

ASHMEADIELLA (ASHMEADIELLA) GILLETTEI Titus, 1904

Specimens of this species from western Texas and southern New Mexico are intermediate between the Great Plains form, *gillettei* (for which the synonym *coloradensis* was used by error in Michener, 1949, Jour. Kansas Ent. Soc., 22:45), and the form previously known as *A. rufiventris* Michener from the arid parts of California and Baja California. It is evident that *rufiventris* should be considered a subspecies of *gillettei*, and that a new subspecific name *(rubra)* should be proposed for the Texan population. The geographical variation can be described as follows:

Specimens from the plains east of the foot of the Rocky Mountains (Boulder and vicinity and Fort Collins, Colorado) and the single known specimen from South Dakota (Badlands National Monument) are rather coarsely punctate, with the mesocutum more coarsely punctate than the vertex. They are wholly black, or in less than half of the population at Boulder (the southernmost of the known great plains localities), there is red on the first two or three metasomal terga and on the posterior femora. This great plains population is properly known as *A. gillettei gillettei.*

Specimens from western Texas and southern New Mexico are about as coarsely punctate as is true *gillettei* but the abdomen is almost wholly red above, the posterior femora are red and the tibiae partly so. This population is to be known as *A. gillettei rubra.*

The populations from the deserts of California and Baja California are similar in coloration to *rubra* although often with more black on the apical portion of the abdomen. They differ from *rubra* particularly by the somewhat finer punctation, that of the mesoscutum being little if any coarser than that of the vertex. This subspecies is *A. gillettei rufiventris.*

A. gillettei ranges westward into the driest parts of cismontane southern California where it is represented by a population similar to *rufiventris* but having more black on the abdomen. In order to name this subspecies in connection with other forms of *gillettei*,

it is described below as *A. gillettei cismontanica,* even though it is not from Texas.

Ashmeadiella (Ashmeadiella) gillettei rubra Michener, new subspecies

Female: Similar to typical *gillettei* but metasomal terga red except for dusky area on sixth, sterna largely red except for fifth and sixth which are black, posterior femora red and posterior tibiae red except for outer surface. Length 5 mm.

Male: Coloration similar to female but with median black areas on fifth and sixth terga (in some paratypes these terga black except for sides and posterior margins and median black areas present on third and fourth terga). Length 5 mm. (varying to 5.5 mm. among paratypes).

Holotype female: Sanderson, Texas, on *Dalea formosa,* April 13, 1949 (R. H. Beamer, C. D. Michener). *Allotype* male and eight male *paratypes:* Rankin, Texas, April 10, 1949 (R. H. Beamer, C. D. Michener). These specimens were taken on the ground.

Additional male specimens, one from each locality, are from El Paso, Texas, April 6, 1902, and Mesilla Park, New Mexico, May 6, 1909.

Ashmeadiella (Ashmeadiella) gillettei cismontanica Michener, new subspecies

Female: Similar to the subspecies *rufiventris* but with tegulae darker; hind tibiae usually with red on under surface only; first metasomal tergum red (or dusky along posterior margin in some paratypes); second and third terga red, black middorsally (or second wholly red); fourth and fifth terga red, only laterally (fourth sometimes with as much as lateral thirds red, fifth sometimes wholly black); sixth tergum black. Length 4.8 mm (to 5.9 mm.)

Holotype female and ten female *paratypes:* one and one-half miles west of Perris, California, on *Heliotropium oculatum,* May 29, 1946 (P. H. Timberlake). One female *paratype,* same locality and collector, May 14, 1948, on *Cryptantha intermedia.* One female *paratype,* four and one-half miles west of Perris, California, on *Hugelia virgata,* May 14, 1948 (P. H. Timberlake).

The holotype and ten paratypes will be returned to the Timberlake collection, Citrus Experiment Station, Riverside, California. Two paratypes will be placed in the Snow Entomological Collection at the University of Kansas.

Ashmeadiella (Ashmeadiella) truncativentris Michener, new species

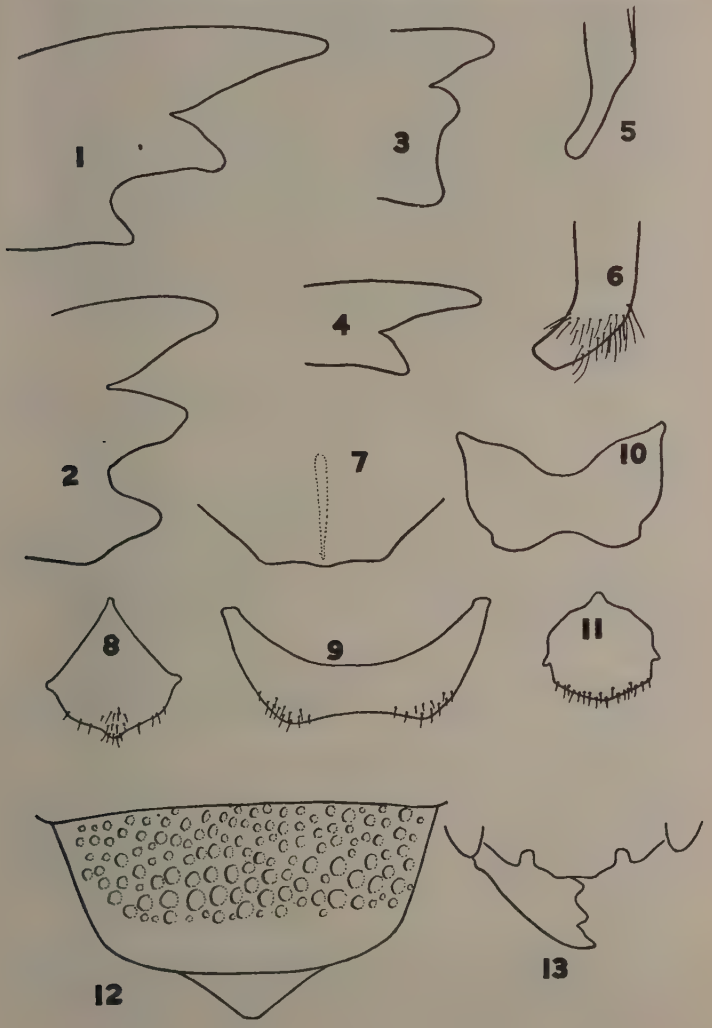
This striking species resembles *A. bigeloviae* Cockerell and its relatives in being black with the legs partly red. It differs, in the female, from *bigeloviae* as well as all other known species of *Ashmeadiella* by having a broad transverse shining subapical ridge across the sixth metasomal sternum, giving it the appearance of being broadly truncate. The hind tibial spurs are thick, black, and strongly curved as in *A. femorata* Michener and *A. titusi* Michener but they have more teeth than in these species, for which reason the male runs out at 2 in the key (Michener, 1939, Amer. Midland Nat., 22:12). The female differs from all species except *A. cactorum* (Cockerell) in lacking a smooth clypeal margin. The clypeus is flatter than in *cactorum*, which is an entirely unrelated and much smaller species.

Female: Length 7.5 mm. (6.0 mm. in paratype). Inner margins of eyes slightly converging below; facial line slightly shorter than transfacial; upper part of head and genal areas with punctures fine and close, becoming progressively coarser on lower part of supra-antennal area, supraclypeal area, and upper two-thirds of clypeus, being quite coarse and irregular and separated by shining ground in the latter area; lower third of clypeus with punctures very fine and dense, only an exceedingly narrow margin slightly raised and not conspicuously punctate; clypeal truncation slightly concave medially, demarked by rather distinct angles, slightly narrower than distance from its end to nearest eye margin; mandibles reddish subapically in paratype, distance from first to third tooth much less than greatest breadth of eye, nearly as great as length of last three antennal segments together; genal areas conspicuously narrower than eyes seen from side; anterior ocellus well behind midpoint between antennal bases and posterior edge of vertex; distance between posterior ocelli subequal to distance from one of them to eye, subequal to or greater than distance to posterior edge of vertex.

Explanation of Figures

1, Mandibular teeth of *Anthocopa beameri*, male. 2, Same, female. 3, Mandibular teeth of *Anthocopa daleae*, female. 4, Same, male. 5, Apex of male gonopod of *Anthocopa daleae*. 6, Same, *Anthocopa beameri*. 7, Clypeus, *Anthocopa daleae*, female. 8, Eighth metasomal sternum, *Anthocopa beameri*, male. 9, Seventh metasomal sternum of same. 10, Seventh metasomal sternum of *Anthocopa daleae*, male. 11, Eighth metasomal sternum of same. 12, Sixth metasomal sternum of *Ashmeadiella truncativentris*, female. 13. Clypeus and mandible of *Ashmeadiella clypeodentata simplicior*, female.

Mesoscutum with punctures small and dense, like those of vertex, anterior margin with weak pair of pubescent spots; punctures of mesepisternum markedly coarser and more widely separated than those of mesocutum or genal areas; tegulae black, distinctly punctured throughout; posterior femora and tibiae, middle femora, part of posterior trochanters, and undersides of middle tibiae red, hind tibial spurs black, strongly curved, outer spur with about eight teeth



on each margin, those of outer margin very low and oblique, inner spur with about nine teeth on each margin, those of outer margin very large and conspicuous, those of inner margin low. Abdominal terga more coarsely punctured than mesoscutum and except for the apical one less closely so; metasomal terga one to five with conspicuous apical bands of white hair, that on fifth weaker than the others; sixth tergum more broadly rounded than in most species; sixth sternum with basal half coarsely punctured, distal half impunctate and elevated to form a strong, slightly arcuate, subapical transverse ridge which is produced to each side to form distinct shoulders on the sternum.

Male: Length 6.2 mm. Similar to female in pubescence, punctation, and structure, but clypeus not so coarsely punctate (though distinctly more coarsely so than vertex); anterior margin of clypeus with concavity, demarked by distinct angles and with an impunctate margin, this concavity about two-thirds as wide as upper width of clypeus; distitarsi rufescent and bases of posterior basitarsi red; hind tibial spurs with fewer teeth (outer margin of inner spur with about six large teeth) except for inner margin of inner spur which has ten or eleven teeth; lateral teeth of sixth tergum large and acute, median teeth longer than basal width, emargination between them deeper than a semicircle.

Holotype female, *allotype* male, and one female *paratype:* SANDERSON, TEXAS, on *Dalea formosa*, April 13, 1949 (R. H. Beamer, C. D. Michener).

Ashmeadiella (Arogochila) clypeodentata simplicior Michener, new subspecies

Female: Differs from typical *clypeodentata* Michener by the weaker angles and emarginations of the median lobe of the clypeus, which is practically without a median emargination. Length 5.0 to 6.5 mm.

Holotype female and one female *paratype:* HOT SPRINGS, BIG BEND NATIONAL PARK, TEXAS, on *Prosopis juliflora*, April 11, 1949 (R. H. Beamer, C. D. Michener).

A. clypeodentata clypeodentata has been found only in the deserts of California and northwestern Mexico. The occurrence of the species in Texas is therefore interesting. It is of course possible that the Texan form is a different species but in view of the morphological similarity to the western form, this seems unlikely.

ASHMEADIELLA (AROGOCHILA) EREMA Michener, 1939

A single female specimen was collected twenty-five miles southeast of Dryden, Texas, on *Dalea argyraea*, April 13, 1949 (R. H.

Beamer, C. D. Michener). This species was previously known only from the desert of eastern California. The Texan specimen differs from Californian ones in the broader dorsal black area of the abdomen.

Ashmeadiella (Chilosima) rhodognatha Cockerell, 1925

Cooper's Store, Big Bend National Park, Texas, on *Dalea neomexicana,* April 11, 1949 (C. D. Michener, R. H. Beamer). This species has not been known previously east of California and Baja California. The record is particularly interesting since it seems that *rhodognatha* is replaced in Arizona and New Mexico by the closely related form, *A. holtii* Cockerell. Unfortunately, only a single male specimen was obtained in Texas.

GELASTOCORIS ROTUNDATUS CHAMPION IN CALIFORNIA

(Hemiptera: Gelastocoridae)

On February 24, 1951, a series of thirteen *Gelastocoris rotundatus* Champion[1] was taken by the writers on the bank of a small stream in Bennett Wash, eight miles southwest of Parker Dam, San Bernardino County, California. *G. rotundatus* is widely distributed in Mexico and Guatemala. Champion[1] remarks that this species ". . . will almost certainly be found to inhabit the Southern United States." Martin[2] records two specimens taken at Douglas, Arizona, in August, by F. H. Snow, and cites this as the first published record for the species in the United States.

G. rotundatus may be distinguished from all other members of the genus by means of the broadly convex, feebly sinuate pronotal margins, and by the male genitalia[2]. The members of our series are relatively uniform in coloration, all being pale greenish above and brick-red on the abdominal sternites.

—P. A. Adams and C. Don MacNeill.

[1]Champion, G. C., 1901, Biol. Centri.-Amer., Zoologia, Insecta, Rhynchota, Hemiptera-Heteroptera, 2:347, Tab. 20, fig. 18.

[2]Martin, C. H., 1928, Univ. of Kans. Sci. Bul., 18 (4):357, 363, pl. 58, fig. 16; pl. 59, fig. 8.

NEW NORTH AMERICAN SPECIES OF NEMOGNATHA AND ZONITIS

(Coleoptera, Meloidae)

J. W. MacSwain

University of California, Berkeley

Descriptions of the following new species are being published at this time in order to have names available for larval studies now in progress. The genus *Nemognatha* is treated here as belonging to the tribe Nemognathini which also includes the genera *Tricrania* and *Hornia* in North America. These three genera have the median tube of the male terminalia entirely membranous, a specialization not found among other meloids of this fauna. The genera *Zonitis* and *Gnathium* are included in the tribe Zonitini which exhibits the primitive condition of the aforementioned structure. Here the median tube is a heavily sclerotized and bilobed structure. By these definitions the species included in LeConte's (1880) key to the genus *Nemognatha* would remain in this genus with the exceptions of *immaculata* LeConte (=*Z. sayi* Wickham), *punctipennis*, *cribricollis* and *vittigera*. These species belong in the genus *Zonitis* near *Z. perforata* Casey, *Z. dunniana* Casey, *Z. atripennis* Say and *Z. bilineata* Say. *Z. flavida* LeConte is a well-marked western subspecies of *atripennis* and is not deserving of specific rank.

Zonitis, as considered here, is divisible into two species groups. The first and most typical includes those species listed in the previous paragraphs with the possible exception of *atripennis*. The second includes *longicornis* Horn, *vittipennis* Horn, *schaefferi* Blatchley, *arizonica* Van Dyke, *sulcicollis* Blatchley, *vigilans* Fall and *martini* Fall. *Z. vermiculatus* Schaeffer, although somewhat distinct, may be placed provisionally with the first group.

The structural modifications by which the *longicornis* group may be defined are: eyes strongly produced beneath the head, usually separated by less than the length of the second antennal segment; pronotum subcampanuliform; antennae setiform; male with fifth sternite deeply emarginate and with a distinct median impression; female with fifth sternite strongly emarginate, sixth sternite deeply triangularly emarginate; maxillae never produced. This combination of characters indicates the distinctness of this section of the

genus and might well be used to establish a separate subgenus. However, with the present confused status of these groups from a world standpoint such a move would seem premature at this time.

Zonitis aureus MacSwain, new species

Body surface shining. Color yellow, except antennae, apices of femora, tibiae and greater part of tarsi which are piceous, extreme base of first segment of middle and posterior tarsus pale. Length 7.5 — 9 mm.

Male: Head short, distance from vertex to apex of labrum equal to distance across tempora; surface smooth shining, sparsely punctate and pubescent, with a few fine punctures and short pale setae, setae on clypeus and labrum longer; antennae long, three times as long as pronotum, slightly tapered to apex, filiform, successive lengths of antennal segments in millimeters: .44, .37, .52, .52, .54, .54, .52, .50, .46, .48, .56, sixth segment almost three times as long as wide; mandibles strongly angulate at middle; maxillae not produced beyond mandibles. *Thorax* feebly punctate and pubescent throughout; pronotum strongly transverse, one-fourth wider than long, lateral margins evenly and broadly rounded, widest just in front of middle, surface smooth, shining, almost impunctate, a few, short, pale setae on disc, setae somewhat more dense on posterior margin, disc evenly rounded; elytra without distinct punctures, feebly rugose, somewhat transparent, with a few, short, pale setae. *Legs* with posterior tibial spurs moderately thickened, equal in length, outer spur one and one-half times as broad as inner spur, obliquely truncate near apex, inner spur flattened, parallel-sided, stick-like; tarsal claws with 13 or 14 spines in inner row. *Abdomen* with surface shining, a few, long, pale, scattered setae; fifth sternite broadly emarginate, sixth sternite deeply cleft.

Holotype male (Calif. Acad. Sci., Ent.): Grant Lake, Mono Co., California, on flowers of *Chrysothamnus* sp. August 3, 1950 (J. W. MacSwain); and four *paratypes*, one same data as holotype, three same locality as holotype August 5, 1948 (P. D. Hurd and J. W. MacSwain).

This attractive species is morphologically similar to *vermiculatus* Schaeffer but may be separated by its color, pronotal shape, sparse punctation and pubescence.

Zonitis maculicollis MacSwain, new species

Body surface feebly shining. Color rufo-testaceous, except antennae, elytra, legs, portions of metasternum, small spot between eyes and paired spots on each side of midline in anterior third of pronotal disc which are piceous. Length, 6 — 11 mm.

Male: Head elongate, distance from vertex to apex of labrum considerably greater than distance across tempora; surface shining, with moderately coarse to fine punctures, punctures moderately dense between eyes, finer and sparser on vertex, with short, pale pubescence, setae longer on clypeus and labrum; eyes moderately large, separated in front by a distance slightly greater than length of sixth antennal segment, beneath by a distance equal to sixth antennal segment; antennae extremely long, three and one-half times as long as pronotum, setiform, successive lengths of antennal segments in millimeters: .58, .47, .63, .73, .73, .73, .73, .70, .63, .58, .73, sixth segment over four times as long as wide; mandibles slightly and evenly curved to apex, maxillae produced beyond mandibles a distance equal to length of mandibles. *Thorax* uniformly, finely, and densely punctate except on pronotum; pronotum, subcampanuliform, about as long as width across base, finely, but only moderately, densely and somewhat irregularly punctured, with extremely short, pale, erect setae, surface evenly rounded except median line which is sulcate posteriorly; elytra densely and moderately coarsely punctate, with fine, short, pale, appressed pubescence. *Legs* with posterior tibial spurs thickened, obliquely truncate in lateral aspect, subacute and subequal; tarsal claws with inner row of spines decreasing in number from anterior pair to posterior (15, 13, 11). *Abdomen* with surface moderately shining, with fine, dense punctures and moderately long, pale, dense pubescence; fifth sternite broadly emarginate, with a sharp, median impression; sixth sternite deeply cleft.

Female similar to male but with fewer spines on tarsal claws (8, 8, 8); sixth sternite with a deep U-shaped emargination.

Holotype male (Calif. Acad. Sci., Ent.): Tracy, San Joaquin Co., California, on flowers of *Frankenia grandifolia* C. & S., July 29, 1949 (J. W. MacSwain); *allotype* female (Calif. Acad. Sci., Ent.) same data as holotype; and 85 *paratypes* same data as holotype.

This species is related to *Z. vigilans* Fall and belongs with that species in the *longicornis* group. However, it may be separated by its darker color, much smaller and more distant eyes, larger head and pronotum, and details of punctation. The eyes in this species are smaller and more distant than in *Z. martini* Fall. The coloration varies somewhat in the type series with the maculations of the head and pronotum being absent in a few specimens while in others portions of the abdomen are suffused with brown.

Zonitis propinqua MacSwain, new species

Body surface feebly shining. Color testaceous, except antennae, maxillary prolongations, maxillary palpi, last segment of labial

palpi, apices of femora, tibiae except inner basal face and tarsi which are piceous. Length 10 — 18 mm.

Male: Head moderately elongate, distance from vertex to apex of labrum greater than distance across tempora; surface feebly shining, with fine and extremely dense punctures, clothed with moderately long, pale pubescence; antennae robust, two and one-half times as long as pronotum, segments cylindrical, successive lengths of antennal segments in millimeters: .74, .51, .66, .74, .66, .66, .58, .66, .55, .51, .70, sixth segment scarcely twice as long as wide; mandibles slightly and evenly convex to apex; maxillae produced beyond mandibles a distance one and one-fourth the length of the mandibles, prolongations modified as a sucking organ. Thorax uniformly, finely, and very densely punctured, clothed with moderately long, pale, erect pubescence, feebly shining; pronotum considerably wider than long, transverse, lateral margins feebly convex; elytra finely and very densely punctured, punctures distinct, pubescence moderately long, pale, and erect, visible macroscopically. *Legs* with posterior tibial spurs thickened, subequal, outer spur slightly heavier than inner, both obliquely truncate in lateral aspect, apically moderately acute; tarsal claws with inner row of spines decreasing in number from anterior pair to posterior (16, 14, 11). *Abdomen* with surface feebly shining, finely and densely punctate, with moderately long, pale, semi-appressed pubescence; fifth sternite with a distinct, short, median impression; sixth sternite deeply cleft.

Female similar to male but with a different number of spines on the tarsal claws (15, 15, 15); sixth sternite with a moderately deep, V-shaped emargination.

Holotype male (Calif. Acad. Sci., Ent.): Alpine, Brewster Co., Texas, July 2, 1942 (E. C. Van Dyke); *allotype* female (Calif. Acad. Sci., Ent.): same data as holotype; and 16 *paratypes* same locality as holotype and following dates and collectors: 2, May 19, 1937 (K. Maehler), 1, July 1, 1942 (H. A. Scullen), 2, July 1, 1942 (E. C. Van Dyke), 2, July 2, 1942 (E. C. Van Dyke), 3, July 7, 1942 (H. A. Scullen), 5, July 8, 1942 (E. C. Van Dyke), 1, July 11, 1946 (M. Marquis).

The following additional specimens of this species were examined but not included in the type series: 2, 5 mi. E. Alpine, Brewster Co., Texas, June 5, 1942 (E. S. Ross), 1, Marathon, Brewster Co., Texas, July 7, 1942 (E. C. Van Dyke), 1, Chisos Mts., Brewster Co., Texas, July 7, 1946 (E. C. Van Dyke), 2, Davis Mts., Jeff Davis Co., Texas, July 11, 1946 (E. C. Van Dyke), 2, White Rose Canyon, Jeff Davis Co., Texas, June 18, 1947 (A. T. McClay), 1, Uvalde, Uvalde Co., Texas, June 15, 1930 (J. O. Martin), 9,

Pecos, Reeves Co., Texas, June 18-19, 1947 (A. T. McClay), 1, Loving, Eddy Co., New Mexico, June 5, 1945 (J. W. MacSwain), 3, San Jon, Quay Co., New Mexico, July 5, 1938 (R. P. Allen), 2, Mt. Hope, Sedgwick Co., Kansas, July 22, 1909 (F. E. Blaisdell) and 1, Onaga, Pottawatomie Co., Kansas, June 19, 1923 (Crevecoeur).

This species is closely related to *Z. vittigera* (LeConte) but differs in its lighter color, denser pubescence, shorter maxillary prolongations and the lack of elytral vittae. In addition, it has a more southerly distribution although occurring principally in June and July as does *vittigera*. These two species are related to *Z. perforata* Casey which has short maxillary prolongations, as in *propinqua*, and reddish-brown elytra which are coarsely but only moderately densely punctured.

Nemognatha cantharidis MacSwain, new species

Body surface shining, elytra dull. Color: head piceous; antennae, palpi, maxillae, metasternum, and legs dark brown, nearly piceous; pro-, mesothorax and abdomen orange; elytra flavo-testaceous with dark piceous suffusion near humeri and apices, coloration variable, rarely with all of elytra, except extreme outer margin, piceous. Pubescence golden. Length 9 — 11 mm.

Male: Head elongate; tempora evenly rounded; surface moderately, coarsely and densely punctured, a narrow, median, sparsely punctate area extending from between eyes to vertex; antennae filiform, less than three times length of pronotum, successive lengths of antennal segments in millimeters: .51, .33, .51, .53, .48, .48, .44, .44, .37, .37, .50, sixth segment twice as long as wide; mandibles elongate, moderately, strongly, and obtusely convex beyond middle; maxillae produced beyond mandibles a distance equal to one and one-half times length of pronotum, clothed with appressed scale-like setae. *Thorax*, except pronotum, finely and densely punctured; pronotum moderately and coarsely punctured; punctures moderately, but irregularly, dense, pronotum as long as wide, widest just in front of middle, rapidly narrowed to apex, slightly narrowed to base, disc with a faint median impression, surface feebly sulcate on each side of midline in front of middle; scutellum with a sharp, deep impression at extreme base, usually partially hidden under posterior margin of pronotum; elytra densely punctate, most punctures confluent, clothed with dense, appressed, golden pubescence. *Legs* with posterior tibial spurs equal, broad, obtuse; tarsal claws with spines of inner row decreasing in number from anterior pair to posterior (14, 12, 10). *Abdomen* finely and moderately densely punctured; fifth sternite feebly and broadly convex, sixth sternite deeply cleft.

Female similar to male but with a different number of spines on the tarsal claws (10, 10, 10); sixth sternite evenly transverse.

Holotype male (Calif. Acad. Sci., Ent.): Bennett Wash near Parker Dam, San Bernardino Co., California, on flowers of *Encelia* sp., February 24, 1951 (C. D. McNeill and P. A. Adams); *allotype* female (Calif. Acad. Sci., Ent.) same data as holotype; and 15 *paratypes* as follows: 1, same data as holotype, 5, 3 mi. S. Palo Verde, Imperial Co., California, on flowers of *Geraea canescens*, April 8, 1949 (P. D. Hurd), 1, Ocotillo, San Diego Co., California, April 6, 1949 (P. D. Hurd), 6, 5 mi. S. E. Ocotillo, San Diego Co., California, on flowers of *Pluchea sericea*, April 23, 1950 (J. W. MacSwain), and 1, Palm Springs, Riverside Co., California, April 16, 1916 (J. O. Martin).

The following additional specimens of this species were examined but are not included in the type series: 5, 9 mi. up Arroyo Santa Maria, Baja California, Mexico, March 29, 1950 (G. A. Marsh).

N. cantharidis is related to *N. zonitoides* Duges but may be distinguished by its larger size, coloration, pubescence and the shape of its pronotum which is not campanuliform as in *zonitoides*.

Nemognatha hurdi MacSwain, new species

Body surface feebly shining. Color flavo-testaceous to testaceous with following exceptions which are dark brown or piceous: antennae, palpi, mandibular apices, maxillae, meso- and metasternum, scutellum and part or all of first five abdominal segments; elytra with apex piceous and a piceous vitta near lateral third which tapers markedly before humeri. Pubescence short and pale, sparse or dense. Length 10 — 13 mm.

Male: Head moderately elongate, subtriangular, tempora diverging behind the eyes, vertex tumid; surface finely and evenly densely punctured, macroscopically glabrous; antennae filiform, less than two and one-half times length of pronotum, segments not flattened, successive lengths of antennal segments in millimeters: .66, .39, .70, .55, .58, .58, .44, .41, .41, .39, .55, sixth segment slightly over twice as long as wide; mandibles robust, strongly curved near middle; maxillae produced beyond mandibles a distance one-fourth greater than length of pronotum, clothed with short semi-erect setae. *Thorax*, except pronotum, finely and densely punctured, clothed with moderately long, pale setae; pronotum only one-sixth wider than long, margins widest in front of middle, converging slightly toward base, basal

angles expanded, surface finely and moderately densely punctured, most punctures separated by scarcely their own diameter, disc evenly rounded with a fine median impression, macroscopically glabrous; scutellum with fine regular punctures, feebly sulcate; elytra densely punctulate, punctures distinct near humeri, confluent elsewhere, clothed with fine, short, pale, dense, appressed pubescence, giving elytra a dull appearance. *Legs* with posterior tibial spurs unequal, outer spur somewhat thickened from base to apex, apex broadly rounded, inner spur stick-like, apically somewhat acute; tarsal claws with inner row of spines decreasing in number from anterior pair to posterior (16, 14, 12). *Abdomen* with surface feebly shining, finely and densely punctured, small triangular median areas of dense pubescence on third and fourth sternites, fifth sternite evenly and slightly convex, sixth deeply cleft.

Female similar to male but with a different number of spines on the tarsal claws (10, 10, 10); fifth sternite with a small feeble emargination, the sixth not visible.

Holotype male (Calif. Acad. Sci., Ent.): TESLA, ALAMEDA CO., CALIFORNIA, on flowers of *Grindelia* sp., September 18, 1945 (J. W. MacSwain); *allotype* female (Calif. Acad. Sci., Ent.) same data as holotype; and 7 *paratypes*, 1, same data as holotype, 5 same locality as holotype, October 6, 1941 (J. W. MacSwain).

The following additional specimens of this species were examined but are not included in the type series: 1, 2 mi. W. Antioch, Contra Costa Co., California, September 12, 1945 (J. W. MacSwain), 1, Marsh Creek Canyon, Contra Costa Co., California, reared from cell of *Melissodes* sp. collected February 18, 1947 (G. E. Bohart and J. W. MacSwain), and 1, Mormon Bar, Mariposa Co., California, September 6, 1938 (T. G. H. Aitken).

This species is distinguished by its short, pale pubescence, punctulate elytra, coloration, antennae, and tibial spurs. Its affinities are with *N. dichroa* LeConte. It is most often collected in association with the much commoner *N. apicalis* LeConte.

Nemognatha soror MacSwain, new species

Body surface shining. Six discontinuous coloration patterns are known; coloration of three commonest forms (condition of type first) with approximate frequency of each form expressed in per cent; black, head, pronotum and apex of abdomen rufo-testaceous (45%), entirely black (25%), entirely brown (25%). Pubescence usually black moderately dense to sparse. Length 7.5 — 15 mm.

Male: Head short, distance from vertex to apex of labrum less than distance across tempora, tempora diverging somewhat behind the eyes, vertex not tumid; surface moderately coarsely and moderately densely punctured, punctures with long, black, erect setae, a small, median impression between the eyes; antennae filiform, serrate, segments somewhat flattened, slightly more than twice as long as pronotum, successive lengths of antennal segments in millimeters: .48, .39, .51, .51, .44, .44, .41, .41, .38, .38, .51, sixth segment slightly less than twice as long as wide; mandibles robust, moderately curved near middle; maxillae produced beyond mandibles a distance equal to the length of the pronotum, clothed with short, semi-erect hairs. *Thorax*, except pronotum, finely and moderately densely to densely punctured; pronotum finely and moderately sparsely punctured, most punctures separated by at least their own diameter, punctures on disc set with moderately long, black setae which are inclined anteriorly, pronotum transverse, parallel-sided, subrectangular, one-third wider than long, disc without a median impression, a small, irregular, impunctate area near each side just in front of middle; scutellum feebly sulcate; elytra finely and moderately densely punctate, surface rugose, clothed with short, moderately dense, semi-appressed, black pubescence. *Legs* with posterior tibial spurs unequal, outer spur slightly thicker than inner and obliquely truncate, inner spur stick-like, apically acute; tarsal claws with inner row of spines decreasing in number from anterior pair to posterior (16, 14, 12). *Abdomen* with surface shining, finely and moderately densely punctured, clothed with long, dark, semi-appressed pubescence; fourth and anterior part of fifth sternites with a median patch of dense pubescence; fifth sternite moderately and evenly convex, with a distinct median impression on posterior margin; sixth sternite deeply cleft.

Female similar to male but with a different number of spines on the tarsal claws (10, 10, 10); fifth sternite with a small feeble median emargination, the sixth not visible.

Holotype male (Calif. Acad. Sci., Ent.): 4 mi. W. Quincy, Plumas Co., California, on flowers of *Achillea* sp., June 24, 1949 (J. W. MacSwain); *allotype* female (Calif. Acad. Sci., Ent.) same data as holotype; and 90 *paratypes* (various color forms) same locality as holotype, various dates from June 19, 1949 to July 3, 1949 by following collectors (P. D. Hurd, J. W. MacSwain, A. S. Deal, R. C. Bechtel, W. F. Ehrhardt, L. W. Isaak, E. I. Schlinger, H. A. Hunt, Claude I. Smith, D. Cox and L. L. Jensen).

A number of specimens from areas adjacent to the type locality were studied as well as the two following collections; 95 specimens Pinnacles, San Benito Co., California on flowers of *Achillea*, May 25, 1941 (J. W. MacSwain) and 15 specimens Princeton, British Columbia, June 16, 1921 and July 30, 1922 (R. Hopping).

This species belongs with the *dubia-dichroa* complex. *Soror* can be recognized by the very short maxillae, which are several times as long in the other species, and the transverse pronotum as well as by the details of the punctation and pubescence.

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LIRIOMYZA LANGEI, A NEW SPECIES OF LEAF MINER OF ECONOMIC IMPORTANCE IN CALIFORNIA

([1]Diptera: Agromyzidae)

Kenneth E. Frick

Irrigation Experiment Station, Prosser, Washington

The agromyzid described below has been confused with *Liriomyza flaveola* (Fallén, 1823) (Lange, 1945; Smith and Lange, 1946; Jefferson and Pence, 1948, 1949), and *L. orbona* (Meigen, 1830) (Melander, 1913; Frost, 1943; Lange and Smith, 1947).

The species is named in honor of W. Harry Lange, Jr., entomologist on the University of California staff, who has studied its biology and methods of control. The common name "pea leaf miner" is suggested since the species has primarily been a pest of garden pea (*pisum sativum*). More recently, this same species has caused damage to aster plantings in southern California (Jefferson and Pence, 1949).

Liriomyza langei Frick, *new species*

Male—Shining black and yellow. Head yellow; ocellar triangle and back of head black, black of back reaching eye margin immediately dorsad of median curve on posterior margin and extending as dusky brown ventrally on genovertical plates between eyes and vti and fronto-orbital setae to lower ifo setae. Antennae yellow, third segment faintly darkened distally; arista black. Proboscis and palpi yellow. Thorax with mesonotum shining black, extending laterally to humeri, prs, sa, and outer pa setae; anepisternum (fig. 1) mostly black, narrowly yellow posteriorly, rather broadly so dorsally, ventral margin irregular; katepisternum (fig. 1) broadly black, narrowly yellow dorsally; anepimeron black, yellow margin anteriorly rather broad, narrow ventrally. Legs black, tips of femora yellowish, fore- and mid-femora yellowish brown to yellowish on inner sides nearly to trocanters; tarsi black. Halteres yellowish. Wings hyaline, calypters gray, margins blackened; setulae of fringe black. Abdomen black dorsally; first segment anteriorly very narrowly yellow; all segments but first posteriorly very narrowly yellow, i.e., posterior of last row of setulae; pleurae yellow; sternites broadly yellow posteriorly, brownish anteriorly. Hypandrium black; cerci yellow.

Head—Eyes large. Genae rather elongate ventrally, more so posteriorly, one-third eye height midway between posterior margin and vibrissa; only slightly sunken centrally; four setae on subcranial margin; vibrissa about three times as long as these setae; parafacial

[1]Published as Scientific Paper No. 910, Washington Agricultural Experiment Stations, Institute of Agricultural Sciences, The State College of Washington, Pullman.

region raised above eye margin, genovertical plates only slightly so. Genovertical plates moderately broad, each approximately one-fourth width between eyes; two ifo (three on one side); two sfo, all subequal in length; os small, sparse, about five in number, dorsalmost slightly dorsad of lower sfo. Frontal vitta two-thirds as broad as long, very slightly sunken below genovertical plates; ocellar triangle of normal size, about four small setulae, ocellar setae long, nearly equaling frontal vitta. Lunule small, semicircular in outline; mesofacial plate about two-thirds as long as broad, a very low rounded median carina becoming inconspicuous between approximate antennal bases; postclypeus narrow, not over one-fourth height of mesofacial plate. Antennae with third segment rounded, broader than long, in width one-third eye height, very finely pubescent; arista short, two and a half times as long as height of third segment, slightly swollen on basal fourth. Proboscis rather large; palpi short, cylindrical.

Thorax—Mesonotum slightly longer than broad; one h and three and five setulae on humeri; one prs, a setula less than one-third length of prs anterior to it; one sa; 0 ia, five to seven setulae in ia row; two pa, inner strong, two-thirds length of outer; 3 + 1 dc, strong, a setula about one-third length of fourth immediately anterior to it; distances between them, beginning with first, 2.25 : 1.75 : 2; acr sparse, relatively long, ten in about four irregular rows reaching posteriorly to second dc. Pleurae with pp very strong; two npl, strong, subequal; one aes, two setulae near dorsal margin dorsally directed, two on posterior margin posteriorly directed, one dorsad of and the other ventrad of aes (fig. 1); one kes, one setula anterior to it, dorsally directed.

Legs—All tibiae with a short apical spur, two on mid-tibiae, stronger; no setae centrally on mid-tibiae.

Wings—About two and one-fourth times as long as broad, veins strong; costa reaching M_{1+2}, distad of wing tip; costal segments in proportions of 7 : 1.75 : 1.5; crossvein r-m basad of termination of R_1 in costa; crossvein m-m present, at an oblique angle, 1.2 times its length from r-m; ultimate section of R_{4+5} about nine times as long as penultimate; ultimate section of M_{1+2} nearly 7.5 times as long as penultimate; ultimate section of M_{3+4} about two times as long as penultimate, ending in margin two-thirds of distance from wing base to apex; Cu + Pl extending about three-fourths of distance to wing margin.

Abdomen—Elongate ovoid; rather sparsely covered with moderately long slender setulae; hypandrium with very few setae.

Size—1.75 mm. in body length; wing: 1.75 mm. in length.

Female—Similar to male in coloration and general appearance; os setae extending slightly dorsad of lower sfo, six and eight in number; second antennal segments slightly darkened; three setulae on each humerus; acr setae about 23 in number, four irregular rows reaching posteriorly to second dc; anepisternum with three posteriorly directed setulae, two dorsad of aes; sixth abdominal

segment with posterior yellow margin rather broad, one-fourth width of segment; seventh segment large, conical, one-fourth length of abdomen; two irregular rows of relatively long setulae on posterior half; shining black.

Size— 2 mm. in body length; wing: 2 mm. in length.

Holotype ♂: SUNNYVALE, SANTA CLARA COUNTY, CALIFORNIA, October 15, 1948, K. E. Frick, reared from a leaf mine on garden pea; deposited in the California Academy of Sciences. *Paratypes:* 17 ♂♂, 29 ♀♀, topotypical; 2 ♂♂, 6♀♀, Sunnyvale, Santa Clara County, California, September 28, 1948, K. E. Frick, reared from leaf mines on sugar beet; 1 ♂, 3 ♀♀, Salinas, Monterey County, California, October 30, 1948, K. E. Frick, reared from leaf mines in packages of spinach purchased in Berkeley, California, grocery stores; 3♂♂, Sunnyvale, Santa Clara County, California, September 27, 1948, K. E. Frick, reared from leaf mines on celery; 3 ♂♂, 1 ♀, Soledad, Monterey County, California, November, 1946, A. J. Walz, reared from leaf mines on spinach; 5 ♂♂, 6 ♀♀, San Jose, Santa Clara County, California, October 23, 1928, University of California collection, reared from mines on pea.

Other material examined.—A single specimen, Pullman, Whitman County, Washington, "Webster #5938, Aug. - 5 - 18," reared from leaf mine on pea, leaf and puparium on pin, and other specimens from Washington and Idaho, all in Melander's collection; 82 ♂♂, 87♀♀, topotypical (in alcohol); 25 ♂♂, 15 ♀♀, Sunnyvale, Santa Clara County, California, September 9, 1948, K. E.

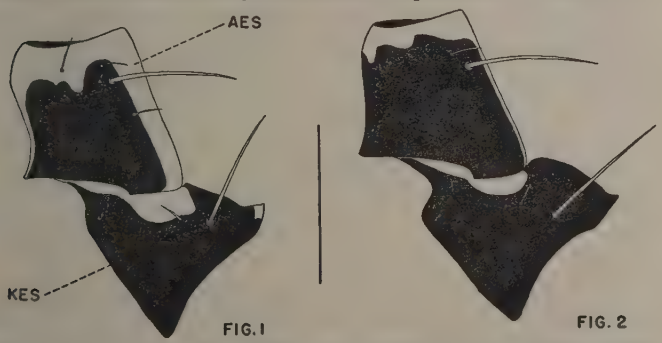

Fig. 1. Anepisternum (AES) and katepisternum (KES) of the holotype ♂ of *Liriomyza langei* n. sp., showing the distribution of yellow and black areas. The solid line equals 0.5 mm.

Fig. 2. Anepisternum and katepisternum of a homotype ♀ of *Liriomyza orbona* (Meigen, 1830), showing distribution of yellow and black areas.

Frick, swept from sugar beet field; 1 ♀, Berkeley, Alameda County, California, November 1, 1948, K. E. Frick, reared from leaf mine on sugar beet; 4 ♀♀, Sunnyvale, Santa Clara County, California, September 9, 1948, K. E. Frick, swept from celery field; 1 ♂, Berkeley, Alameda County, California, October 20, 1948, K. E. Frick, reared from leaf mine on celery grown in a greenhouse; 4♂♂, 1♀, Berkeley, Alameda County, California, November 13, 1948, K. E. Frick, reared from leaf mine on aster or as adults on asters leaves in a greenhouse; 6 ♂♂, 39♀♀, Torrence, Los Angeles County, California, 1948, R. N. Jefferson, reared from leaf mines on aster (in alcohol).

Liriomyza orbona Meigen differs from *L. langei* as follows:

Adult homotype ♀—Dusky color of genovertical plates extending only to lower sfo; third antennal segment yellow on basal two-thirds, abruptly becoming dark brown distally; palpi brownish. Anepisternum black, a very narrow yellow strip on dorsal and posterior margins (Fig 2); katepisternum black, a very small yellowish area dorsally (Fig. 2). First and second abdominal tergites yellow laterally; fourth and fifth entirely black; sixth yellow posteriorly, about one-fifth of tergal width. Head (Hendel, 1931, Fig. 248)—Genae half eye height midway between vibrissa and posterior margin, genovertical plates and parafacial region greatly exceeding eye margin; postclypeus nearly half height of mesofacial plate. Thorax—Setula anterior to prs not differentiated from acr; O ia, about seven setulae in ia row; distances between dc setae, 1.75 : 1.5 : 2; no differentiated setulae anterior to fourth dc; about 30 acr, extending posteriorly nearly to first dc. Wings (Hendel, 1931, Fig. 247)—Costal segments in proportions of 8:2:1.75; crossvein r-m and termination of R_1 about equidistant from base of wing; crossvein m-m less than its own length from r-m; ultimate section of R_{4+5} about 6.5 times as long as penultimate; ultimate section of M_{1+2} about 16 times as long as penultimate; ultimate of M_{3+4} slightly less than 2.5 times the penultimate.

Male terminalia (de Meijere, 1925:289, Fig. 58c, surstylus).—Surstyli bearing setae; strong tooth absent.

Puparium (de Meijere, 1925:273)—Posterior spiracles with about 12 subequal bulbs arranged in an arc; anal lobes small, short, truncate.

Liriomyza orbona is not common in Europe, and the species has never been reared from larvae. De Meijere (1925) reared *L. orbona* adults from puparia found in the debris and refuse left by an overflowing of the Rhein River near Lotith in 1924. The species was not mentioned in subsequent papers. Hendel (1931) mentioned that the ecology was unknown, but since the adults were repeatedly found in meadows, he felt that the larvae are probably grass miners.

Hering recently stated in correspondence that the larvae are probably grass miners.

Hendel (1931) found *Liriomyza orbona* so closely related to *L. flaveola* that he referred to the thoracic setal pattern of the latter species in describing *L. orbona*, noting but a few minor differences. De Meijere (1925) states that the puparium of *L. orbona* is similar to those of *L. flaveola* and of the "*L. pusilla* complex." Hering found several differences between adults of *L. orbona* and *L. langei*, based on material sent to him, adding that *L. langei* does not occur in Europe.

Liriomyza langei may be distinguished from other species of *Liriomyza* by the large size, characteristic wing venation, and distinctive color pattern, particularly of the thoracic pleural region. The new species is closely related to the European *L. orbona* and therefore rather close to *L. flaveola*. On the basis of the form of the surstyli, *L. langei* appears to be closer to the species in the "*L. pusilla* complex" than to *L. orbona*. Hering found that leaves sent to him containing mines made by the larvae of *L. langei* were very similar to those made by the larvae of the European *L. strigata*.

Variations Within the Species

The specimens of this species are quite constant in most characters, particularly in the coloration. The setae vary within relatively narrow limits, the os setae varying from three to eight, sometimes not extending dorsad of the lower sfo; only rarely do three ifo occur on one side (as in the holotype ♂); humeral setulae vary from two to five, with usually three or four present; the acr setae sometimes extend posteriorly to the second dc but are always sparse; an extra posteriorly directed setula sometimes occurs on the anepisternum, and one of the dorsally directed ones is sometimes absent. The most striking variation is the loss of the m - m crossvein (Table I). The crossvein may be vestigial, often being reduced to one or two short vestiges, or absent. The figures indicate that the females tend to have slightly more variation than the males, and that the absence of the crossveins is relatively rare, particularly where one is absent in one wing and the other complete in the other wing.

Larva

(Described from larvae obtained from mines in *Pisum sativum* leaves and preserved in alcohol.) Large, 3.25 mm. in length, five-eights to three-fourths mm. in diameter. White, yellowish on anterior one-third, shining.

Head—Antennae minute, light brown; palpi relatively large, blackish; longitudinal sclerite inconspicuous, narrow, light brown, lateroventral arms not discernible. Mandibles each with two teeth, alternated; labial sclerite three-fourths the length of mandibles, moderately broad, visibly partially separated from paraclypeal phragma; dorsal arm three times the length of labial sclerite, curving anteriorly, nearly straight posteriorly, not narrowing but becoming paler posteriorly; ventral arm two-thirds the length of dorsal, very slender, nearly straight.

Body—Anterior spiracles small, scarcely expanded distally; six bulbs arranged in a single inwardly curving row. Cuticular processes minute, of one size; bands relatively narrow. Posterior spiracles of moderate size; somewhat expanded distally, more so ventrally; seven or eight bulbs, rather widely spaced, arranged in a semicircle, open towards midline. Posterior end truncate; a pair of minute lateral lobes two-thirds of distance from dorsal surface; anal lobes very small, rounded. Calcospherites numerous; large, many slightly over one-sixth larval diameter.

Puparium—Large, 2 mm. in length, nearly 2 mm. in width and height. Reddish brown in color. Subcylindrical, laterally sides subparallel, tapering rather sharply at the ends; ventral surface flattened, dorsal arched; segmentation distinct. Anterior spiracles rather close together, same form as in larva; posterior spiracles subdorsal, about twice as far apart as anterior, moderately long, of same form as in larva. Anal slit dark brown, lateral lobes absent.

Description of the Leaf Mines

The mines are characterized by being relatively wide, even from the start, and often widen to as much as twice the larval width for most of the length. The mines are serpentine and are often so twisted as to cross many times, sometimes having a blotch-like appearance. The frass is deposited almost entirely in small strings forming a nearly continuous slender black line down the center of the mine. The mines are primarily on the dorsal surface of the leaves, but often extend to the ventral, and are usually on the basal half of the leaves, often running down the petioles from which place the larva emerges.

Certain modifications in the mines are found in each species of host plant, and notes are added here based upon mined leaves in the writer's collection. On aster, the mines are usually basal on the leaves, extending down the petiole, often to its base. The lateral ribs appear not to impede larval movement. On pea, the mines are on both surfaces, single mines often alternating. The midribs and lateral ribs seem to act as barriers, the mines usually being confined to a relatively small area and appearing blotch like. There are often two or three mines per leaf, and they are often found on the stems

TABLE 1

Percentages of loss of crossvein m-m in the wings of 455 adults of *Liriomyza langei* n. sp.

Condition of m-m crossveins per specimen	MALE Host	Number	%	FEMALE Host	Number	%	TOTAL Number	%
2 complete	Pea (Sunnyvale)	99	80.4	Pea (Sunnyvale)	117	66.1		
	(San Jose)	5	100.0	(San Jose)	6	100.0		
	Sugar Beet	36	97.3	Sugar Beet	28	80.0		
	Celery	4	80.0	Celery	4	66.6		
	Spinach (Salinas)	2	100.0	Spinach (Salinas)	1	33.3		
	(Soledad)	2	66.6	Aster (Berkeley)	3	100.0		
	Aster (Berkeley)	3	75.0	(Torrence)	35	89.7	350	76.9
	(Torrence)	5	83.3					
1 complete	Pea (Sunnyvale)	9	7.3	Pea (Sunnyvale)	20	11.2		
1 vestigial	Spinach (Soledad)	1	33.3	Sugar Beet	3	8.6		
				Spinach (Soledad)	1	100.0	34	7.5
1 complete	Pea (Sunnyvale)	1	.8	Pea (Sunnyvale)	1	.6		
1 absent	Sugar Beet	1	2.7				3	.66
2 vestigial	Pea (Sunnyvale)	9	7.3	Pea (Sunnyvale)	23	12.9		
	Aster (Berkeley)	1	25.0	Sugar Beet	2	5.7		
	(Torrence)	1	16.6	Celery	2	33.3		
				Spinach (Salinas)	1	33.3		
				Aster (Torrence)	3	7.7	42	9.2
1 vestigial	Pea (Sunnyvale)	3	2.4	Pea (Sunnyvale)	11	6.2		
1 absent	Celery	1	20.0	Sugar Beet	2	5.7		
							17	3.7
2 absent	Pea (Sunnyvale)	2	1.6	Pea (Sunnyvale)	5	2.8		
				Spinach (Salinas)	1	33.3		
				Aster (Torrence)	1	2.6	9	1.9

and pods. Mines on celery are similar to those found on aster in that the mines are usually on the basal portions and often extend down the petiole. However, the leaf ribs appear to inhibit movement and the mines appear to be blotches. The mines on the large leaves of sugar beet and spinach are similar, being found rather often on the outer portions of the leaves, and are not so twisted, but still serpentine.

Acknowledgments

The help of the following persons is gratefully acknowledged: E. M. Hering for aid in determination of the species; A. J. Walz, P. D. Hurd, Jr. (curator of the University of California collection), and R. N. Jefferson for loan of material; W. H. Lange, Jr., for a trip to the Santa Clara Valley; A. L. Melander for permission to study his personal collection; and A. E. Pritchard for reading and criticizing the manuscript.

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Book Notice

Studies Honoring Trevor Kincaid. Editor, Melville H. Hatch. 167 pages, 13 plates. University of Washington Press, Seattle. 1950. Price, $2.50.

In editing this publication, Professor Hatch has set an excellent example for a scientific tribute to a fellow scientist—a biography of the scientist, Professor Trevor Kincaid, a biography of one of his teachers, the history of a society with which Prof. Kincaid was intimately associated, and several zoological papers by his colleagues and former students.

Trevor Kincaid was born in Ontario, Canada, in 1872. He developed an interest in natural history at an early age, at first collecting fossils. At the age of 17, Kincaid moved to Olympia, in the Washington Territory, where his interest turned to entomology and botany. He soon established himself as an energetic collector; by the time he was 22 he had built up a collection of 60,000 specimens and sent over 100,000 specimens to specialists.

Kincaid attended the University of Washington and was given an appointment as an assistant in his second year. In 1901 he received his M.A. degree and was made professor of zoology. At one time or another he taught nearly every course in the department. In 1942 he continued on at a half-time basis and finally, in 1947, became professor emeritus.

His activities have been numerous and diversified, even though much of it has not been translated into written works. His first publication was on the dipterous family Psychodidae; he has described a species of diplopod, and has collected chalcid parasites of the gipsy moth. He accompanied David Starr Jordan to the Pribilof Islands of the Alaska Fur Seal Commission and he served as entomologist on the Harriman Alaska Expedition (the list and description of specimens fills two volumes). However, he is better known by the public for his works in the oyster industry than in entomology, having been largely responsible for the establishment of the oyster industry in the Willapa Harbor region, Washington. He has also been interested in fresh-water plankton and other invertebrate groups.

Professor Kincaid was awarded an honorary Doctor of Science degree by the College of Puget Sound and was the first graduate to be designated by the University of Washington Alumni Association *Alumnus Summa Laude Dignatus*. There are sixty-four plants and animals named in his honor from such groups as Spermatophyta, Foraminifera, Oligochaeta, Isopoda, Insecta, Pisces, and others.

The second portion of this publication, "An Account of the Life of Orson Bennett Johnson," is best summarized in Editor Hatch's own words. "Orson Bennett Johnson was one of the pioneer naturalists of the Pacific Northwest. From 1882 to 1892 he was professor of natural history at the University of Washington, and throughout a quarter of a century of invalidism that dated from the latter year he

built up an extensive insect collection that he gave to the University. Twelve years after his death he was honored by having a new biological laboratory building at the university named for him. The following pages have been written to preserve an account of his life—an account which, though all too brief, is as full as the limited data that are available permit.

"Professor Johnson's major contribution was twofold. In the eighties he brought an enthusiasm for natural history to Seattle and to the University of Washington Territory. He was directly and, through the medium of the membership of the Young Naturalist's Society, indirectly responsible for the distribution to the working specialists of important elements of his local fauna, especially in Mollusca, Decapoda, Lepidoptera, Coleoptera, Diptera, Arachnida, and Pisces—which material would have remained in a certain measure unknown to the scientific world, had it not been for his activities. Living in a pioneer community, without library facilities, in the midst of a strange fauna, he was, perhaps, very wise in constituting himself primarily a collector."

The third section deals with the history of the Young Naturalists' Society. This organization was founded in Seattle in 1879 and was devoted to the study of natural history. The members were amateurs and their meetings consisted chiefly of natural history studies by the members themselves with only a few outside speakers. As the Young Naturalists became older there was not enough new blood to take their place and consequently the Society passed out of existence between 1900 and 1905. The importance of the organization lies in the fact that it was the first group to make a study of the flora and fauna of the Washington Territory and continued this function until the various biological departments of the University of Washington had been established.

The remaining portion of the publication consists of scientific papers written by colleagues and former students of Professor Kincaid. They are as follows: "A comparative study of the thyroid follicle," by S. E. Johnson; "The genotype and systematic position of Sporadogenerina Cushman (Foraminifera, Polymorphinidae)," by D. L. Frizzell; "Review of thirteen genera of South American fishes in the subfamilies Cynodontinae, Hepsetinae, and Characinae, with the description of a new Cyrtocharax," by L. P. Schultz; "Early life history and larval development of some Puget Sound Echinoderms," by M. W. & L. T. Johnson; "Some monogenetic trematodes of Puget Sound fishes," by K. Bonham; "Methods for the study and cultivation of Protozoa," by V. Tartar; "Conopisthine spiders (Theridiidae) from Peru and Ecuador," by H. Exline; and "Some remarks on the blood volume of fish," by A. W. Martin. Although the writer is in no position to pass judgment on these articles, they appear to be in keeping with the good character of the rest of the publication.—Larry W. Quate.

A SPECIMEN OF HOPLOPSYLLUS ANOMALUS (BAKER) LACKING A PRONOTAL CTENIDIUM (SIPHONAPTERA)

Harold E. Stark[1]

An anomalous male specimen of *Hoplopsyllus anomalus* (Baker, 1904) recently was observed while identifying fleas collected by plague survey units of the Western CDC Laboratory.

The pronotal ctenidium, normally present in this species, is entirely lacking and the pronotum is much reduced. The flea appears normal in every other respect and the forelegs appear to be functional. Therefore, it appears doubtful that this lack of a pronotal ctenidium resulted from a mechanical injury in larval life or during mounting. This leaves pathological or embryonic malformation as possible explanations. This anomaly in Siphonaptera is presented merely as a curiosity (Fig. 1).

This specimen of *H. anomalus* was collected 10 mi. E. of Beaver, 7,000 ft., Beaver Co., Utah, by H. C. Owen, May 6, 1949, host: *Citellus variegatus grammurus* (Say).

[1]Medical Entomologist Communicable Disease Center, Public Health Service Federal Security Agency, Atlanta, Georgia. (From Western Communicable Disease Center Laboratory, San Francisco, California.)

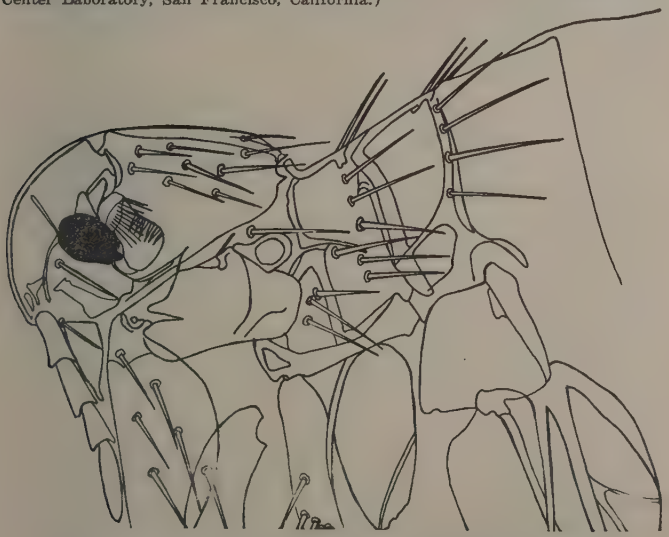

Fig. 1. Hoplopsyllus anomalus lacking ctenidial comb.

DETTOPSOMYIA AND PTILOMYIA: TWO GENERA NEW TO THE UNITED STATES

(Diptera: Drosophilidae; Ephydridae)

MARSHALL R. WHEELER

University of Texas, Austin

While making general collections of acalyptrate Diptera in California and Texas in 1949-50, representatives of two genera not previously reported from this country were found. One of these seems to be relatively widespread and has probably been overlooked or not recognized by other collectors, while the other is more likely a recent introduction into this country from Australia.

DETTOPSOMYIA Lamb (Drosophilidae)

This genus, belonging to the Mycodrosophila-assemblage of genera, was described by Lamb (1914) for his new species *formosa* from the Seychelles. Malloch (1924) described *Drosophila nigrovittata* from Australia, remarking that the species appeared to belong to *Spuriostyloptera* Duda, an oriental genus. Malloch's description clearly shows, however, that *nigrovittata* is not referable to that genus but belongs to *Dettopsomyia*.

In October, 1949, the writer observed larvae and puparia in a rotting, bleeding area of about 20 sq. in. on a large banana plant on the grounds of the Pottinger Hospital in Monrovia, California. Adults were reared and, a short time later, a large number of adults were captured around this banana clump. These specimens matched the description of *D. nigrovittata* in every detail. A permanent colony seems to have become established in this area, since as late as March, 1950, it was a simple matter to collect additional specimens. A single specimen was also taken by sweeping along the Rio Hondo near Montebello, California. Attempts were made to establish a living culture of this species using the usual *Drosophila* culture media, but the stock was lost after about four generations.

It seems logical to assume that *Dettopsomyia nigrovittata* is a rather recent introduction since the area has in past years been well collected by Drs. A. L. Melander and A. H. Sturtevant, both specialists on Diptera. The finding of this Australian species in

California is especially interesting in view of Malloch's (1938) report of *Dettopsomyia formosa* being found in Hawaii in 1936.

In Curran's (1934) key to genera of North American Diptera, this genus will key to couplet 12 of the key to Drosophilidae, where it differs from the remaining genera by the following combination of characters:

Small species with a complex pattern of longitudinal stripes on the mesonotum; costal break exceptionally deep, the lobe well-developed, blackened, and bearing two strong bristles; 2nd and 3rd costal sections nearly equal (costal index about 1.0)....*Dettopsomyia*

PTILOMYIA Coquillett (Ephydridae)

This genus, a member of the Psilopinae, was erected by Coquillett (1900) for his new species *enigma* from Porto Rico. No other species appear to have been described.

More than 70 individuals which appear to be identical with *Ptilomyia enigma* have been taken by sweeping along a small stream in Austin, Texas, in June, 1950. In view of its minute size (about 1 mm.) and its apparent non-rarity, it seems very probable that it has been collected by others but not identified or reported.

A single specimen of an undescribed species belonging to this genus was taken by the writer near Kernville, California, in April, 1950. This specimen, which is slightly larger than the *enigma* from Texas, also differs in having the tarsi about as dark as the rest of the legs and in having distinct dark clouds over the posterior cross-veins. It does not seem desirable to describe and name this species until further material becomes available.

The genus *Ptilomyia* keys correctly in Curran (*op. cit.*). In Cresson's (1942) synopsis of North American Ephydridae, it keys to *Atissiella* Cresson from which it can be separated as follows:

—Arista pectinate, without ventral branches; acrostichals in 2-6 rows, only the prescutellar pair enlarged.....*Atissiella*
—Arista plumose, with both dorsal and ventral branches; acrostichals in 2 sparse rows, several pairs noticeably enlarged..*Ptilomyia*

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A NEW SUBSPECIES OF METATAENIA

(Coleoptera: Buprestidae)

JACQUES R. HELFER

Mendocino, California

Metataenia clotildae refulgens Helfer, *new subspecies*

Holotype, adult female. Length 25.5 mm., with 8.5 mm., elongate parallel, widest near base of elytra; head, pronotum, and elytra brilliant red with golden reflections, pronotum with a pair of yellow foveae laterally near the base, each elytron with five yellow or golden colored depressions, one medial at the base, two at the first third, one medial the other lateral, one fasciaform and medial at about the second third, and one near the suture at the apical fifth, these depressions becoming progressively shallower toward the apices which are metallic blue green; body golden green beneath. *Head* punctate; strongly excavated between the eyes and with a deep longitudinal groove medially in the bottom of the excavation; a strong carina forming the anterior boundary of this excavation, separating it from the strongly notched clypeus; eyes large, only slightly convergent posteriorly, rather strongly convex and noticeably protuberant, brown; jaws black near the tips but mostly metallic green and strongly punctate; antennae 11-segmented, reaching about to the hind angles of the pronotum, the first segment long, testaceous proximally, metallic green distally, second segment very short, third three times as long as second and equal in length to fourth, succeeding segments more thickly punctate, becoming progressively shorter and

broader to the tip, terminal segment again a little longer and subquadrate, last ten segments black; genae and gula green. *Pronotum* finely sparsely punctate, widest at base, with base bisinuate, sides slightly sinuate at basal third then arcuate to front angles, narrowly longitudinally impressed medially, most deeply just before the scutellum; with a fovea at each side near the basal angle, limited externally by a strong upfold of the integument and angling forward toward the anterior angles, becoming rapidly shallower, with a sulphur like efflorescence lending a yellow color underlain by a distinct pubescence; hind angles sharp, front angles bent under, not visible from above. *Scutellum* green, transverse, almost rectangular. *Elytra* with longitudinal rows of small punctures; strongly sinuate laterally when viewed from the side; broadest near the base then slightly sinuate to about the middle, then broadly arcuate and achieving the second greatest width a little behind the middle, narrowing to the apices which are divaricated and end in spines, the last quarter of the margin being strongly toothed; lateral margin rather strongly reinforced with a ridge like thickening; depressed spots pubescent and (except the apical) bearing a yellow efflorescence. There is, in addition to the easily noticed depressions already mentioned, a slight depression which has a few hairs located just forward of the rounded humeral region. *Prosternal spine* punctate, slightly wider after passing between the anterior coxae, subtrilobate, not impressed medially, neatly delimited anteriorly from the remainder of the prosternum by a narrow transverse depression. *Abdomen* with large hairy areas anterolaterally on the segments; sparsely setopunctate elsewhere; last segment emarginate at the tip. *Legs* green, tibiae becoming testaceous distally, tarsi testaceous.

Holotype: Kieta, Bouganville Island, Solomon Islands, XII, 8 to 21-1938 (Van Dyke collection). The type series is part of a large number of specimens collected by the Papuan-Australian expedition of 1938-39, led by R. G. Wind. Type in the California Academy of Sciences (Ent.).

Variation: In a series of twenty-six specimens examined the size ranges from 19 to 25.5 mm. in length and from 6 to 8.5 mm. in width. The color of the dorsum becomes slightly purplish red in a few specimens. One specimen, labeled as part of this series, is green and quite typical of *Metataenia clotildae* (Gestro) sensu stricto, a typical specimen of which I have from Korido Island near New Guinea. Sexes similar.

M. clotildae was described originally as a *Paracupta* but differs from that genus in not having the prosternal spine medially impressed. The variety *M. clotildae cupreosplendens* (Kerremans) which was originally described as a species of *Paracupta* differs from *refulgens* as follows:

cupreosplendens	*refulgens*
Brilliant copper with greenish reflections	Brilliant red with golden reflections
Elytral depressions same color as background	Elytral depressions strongly contrasting with background color
Tibiae entirely testaceous	Tibiae metallic green proximally
New Hanover, Bismarck Archipelago	Bougainville I., Solomon Islands

The other species of *Metataenia* are *M. insulicola* Théry, black and green with gold spots, from Russell Island, *M. quadrimaculata* Théry, bronze-brown with reddish gold spots, English New Guinea, *M. purpurascens* Théry, entirely purple, English New Guinea (Arfak Mts.), and *M. meeki* Théry, entirely bronzed with three powdery pits on the elytra, English New Guinea (Owgarra), all quite different from the present form.

The structure of *refulgens* is, apparently, identical with that of *clotildae* and so I am placing this form as a subspecies of the previously described form. I am following Théry in the use of the generic name *Metataenia* but it should be noted that these forms are very near to the genus *Iridotaenia.*

NEW RECORDS FOR STREBLIDAE AND NYCTERIBIIDAE

(Diptera: Pupipara)

The Streblidae and Nycteribiidae are essentially tropical families which extend up to the southern part of the United States. Jobling (Parasitology 30(3):363, 1938) states, "*Trichobius corynorhini* Cockerell (Streblidae) extends from Oklahoma through Colorado as far as 40° North in Utah and 37° North in California." One male of this species was taken from a bat, *Corynorhinus rafinesquii* (Lesson), probably subspecies *townsendii* (Cooper) at Roseburg, Ore., April 16, 1950, by the author. Two females and a male Nycteribiid, *Basilia forcipata* Ferris were collected August 9, 1940, at Redmond, Ore., from "bat" (collector unknown). Determinations were verified by Dr. J. Bequaert of the Museum of Comparative Zoology, Cambridge, Mass.—VINCENT D. ROTH.